UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

JANUARY, 1890.

CONTENTS.

PREPARED UNDER THE DIRECTION OF
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List of merchant marine steam and sailing vessels from which International Meteorological reports were received at the office of the Chief Signal Officer, U. S. Army, Washington City, in time to be used in the preparation of the Monthly Weather Review for January, 1890.

Name of vessel.	Captain.
Am. s. s. Adirondack	J. Sansom.
Br. Adriatic	J. G. Cameron.
Advance	D. E. Griffiths.
Ailsa	J. W. Morris.
Alaska	W. I. Robertson.
Albany	H. A. Gough.
Alene	E. J. Seiders.
Ger. Allemannia	Geo. Thiele.
Br. Alite	A. E. Lewis.
Alvena	F. McKay.
Alvo	David Williams.
Ger. America	A. Kohlmann.
Br. American	W. Anson.
Dtch. Amsterdam	C. Stenger.
Br. Anchoria	A. Campbell.
Anglia	W. Marr.
Ardangorm	H. Cameron.
Ardmarigh	W. Anderson.
Ascania	G. T. Froshlich.
Athos	H. Low.
Aurania	H. McKay.
Br. Author	R. Owen.
Ger. Australia	F. Spruth.
Br. Baltimore	C. J. Simpson.
Barrowmore	W. H. Moore.
Bavarian	M. Fitz.
Bayonne	J. E. Payne.
Bellona	J. McMillan.
Span. Benito	L. Santaulari.
Benito Estenger	E. F. Canal.
Br. Bessel	Chas. Allcott.
Ger. Bohemia	H. Leithauser.
Br. Borderer	F. Manley.
Bostonian	W. H. Trant.
Bracadale	W. Ward.
Britannic	H. Davison.
British Prince	S. Nowell.
British Princess	E. H. Freeth.
Brooklyn City	W. Fitt.
Buffalo	J. H. Malet.
Bulgarian	R. Lewis.
Ger. California	H. Bauss.
Br. Camden	W. N. James.
Camellia	E. Penney.
Canada	J. Robinson.
Caribbean	H. Daniel.
Caspian	A. McDougall.
Catalonia	J. J. Atkin.
Celtic	H. Parsell.
Cephalonia	T. Dutton.
Am. Chalmette	J. B. Percy.
Fr. Chateau Lafite	M. C. Ollivier.
Am. Cherokee	H. A. Bearse.
Br. Circassia	J. Harris.
Circassian	R. Barrett.
Am. City of Alexandria	J. McIntosh.
Br. City of Berlin	Francis S. Land.
Am. City of Chester	A. W. Lewis.
Br. City of Chicago	A. Redford.
Am. City of Para	J. L. Lockwood.
City of Savannah	C. B. Googins.
City of Washington	J. W Reynolds.
Br. Claribel	T. M. MacKnight.
Colima	R. C. Jennings.
Ger. Colonia	A. Worpel.
Am. Colorado	F. E. Jenkins.
Br. Cornucopia	J. Smith.
Ger. Cremon	F. E. Schwaner.
Br. Croma	W. R. Lord.
Crystal	R. B. Stannard.
Cuban	D. Lawson.
Cuffe	R. Nicol.
Ger. Dania	H. Barends.
Br. Darial	A. H. F. Young.
Dee	J. Pope.
Denmark	R. S. Rigby.
Devonia	Jno. Craig.
Devonshire	A. Purvis.
Duchess	H. Hammond.
Fr. Dupuy de Lome	S. Dechaille.
Br. Durham City	J. A. Jacobsen.
Earnwell	C. N. Mumford.
Dtch. Edam	A. Potjer.
Br. Edgar	W. D. Ellison.
Egglestone Abbey	J. Cooper.
Egypt	J. Sumner.
Br. Egyptian Monarch	T. M. Irvin.
Elgive	H. Bermpohl.
Ger. Eider	H. Baur.
Am. El Monte	R. B. Quick.
Br. Elmville	J. Dove.
Elvaston	W. E. Steele.
England	A. F. Heeley.
Enrique	J. A. de Lauri.
Span. Ethiopia	John Wilson.
Br. Excelsior	H. L. Higgins.
Am. Federalton	R. Pinkham.
Br. France	A. D. Hadley.
Belg. Friesland	W. G. Randle.
Ger. Fulda	R. Ringk.
Br. Galileo	W. Moore.
Gallia	M. Murphy.
Ger. Gellert	C. Knempff.
Br. Germanic	P. J. Irving.
Glenfield	J. Newdick.
Glenrath	C. I. Anderson.
Gloucester City	R. Jones.
Ger. Gluckauf	V. Sarmanski.
Gothia	A. Kahn.
Br. Greece	A. J. Jeffrey.
Ger. Gut Heil	A. Buhner.
Hans and Kurt	Carl Holck.
Br. Haytian	J. Cownrd.
Dan. Hekla	A. C. Thamsen.
Ger. Hermann	W. Schmolder.
Belg. Hermann	D. Meyer.
Br. Hibernian	J. Brown.
Hindoo	Jas. Douglas.
Holland	Thos. Foote.
Br. s. s. Horrox	T. Henning.
Howick	J. Ellis.
Am. Hudson	J. R. Strickland.
Nor. Hugin	J. E. von der Ohe.
Br. India	B. Jamieson.
Am. Indiana	W. J. Boggs.
It. Iniziativa	A. Conzoneri.
Br. Iowa	E. W. Owens.
Irlington	C. W. Barnard.
Dan. Island	W. Skjodt.
Br. Istrian	A. W. Ball.
Ger. Italia	G. Schmidt.
Br. Italy	W. Pearce.
Ixia	Wm. Churnside.
Kansas	A. Fenton.
Kate	J. S. A. Durkie.
Kate Fawcett	C. F. Young.
King's Cross	G. J. Mills.
Am. Knickerbocker	F. Kimble.
Fr. La Bourgogne	E. Franguel.
La Champagne	Boyer.
Br. La Flandre	H. W. Ninnes.
Fr. La Gascogne	Santelli.
Ger. Lahn	H. Hollmers.
Br. Lake Ontario	H. Campbell.
Lake Superior	Wm. Stewart.
Lake Winnipeg	F. Carey.
Am. Lampassas	M. B. Crowell.
Fr. La Normandie	G. Collier.
Ger. Leipzig	D. Kohlenbeck.
Br. Lero	J. Chisholm.
Lisnacrieve	F. R. Evans.
Lochmore	A. H. Kett.
Longstone	W. G. Thompson.
Lord Clive	P. Urquhart.
Lord Gough	E. M. Hughes.
Lord O'Neill	A. Ferris.
Am. Louisiana	E. V. Gager.
Br. Lucerne	J. W. Nunan.
Ludgate Hill	J. Brown.
Lydian Monarch	T. C. Huggett.
Maine	H. Bocquet.
Manitoban	J. M. Johnstone.
Marengo	W. Whitton.
Ger. Marsala	N. Maas.
Br. Maetello	R. Potter.
Mascotte	Jas. Ross.
Span. Mendes Nunes	D. J. Lopes.
Br. Mentmore	R. Waite.
Minnesota	R. Griffith.
Missouri	T. F. Gates.
Montana	W. H. Williams.
Ger. Moravia	O. Winkler.
Am. Mount Edgecombe	J. Wetherell.
Br. Muriel	G. S. Locke.
Naranja	J. Silly.
Span. Navarro	S. de Aldecocea.
Ger. Neckar	H. Supmer.
Belg. Nederland	E. Bence.
Br. Neptuno	A. Chrystal.
Nessmore	G. Elliott.
Nestorian	J. Franco.
Fr. Neustria	P. Verries.
Br. Nevada	J. A. R. Cushing.
Belg. Noordland	H. E. Nickels.
Nor. Norrona	J. J. Isakjen.
Br. Norseman	R. Williams.
Norwegian	W. Christie.
Am. Nueces	Sam Risk.
Dtch. Obdam	G. Bakker.
Ger. Ocean	A. Voge.
Br. Oceanic	W. W. Smith.
Am. Ohio	R. W. Sargent.
Br. Ontario	W. P. Couch.
Oregon	H. C. Williams.
Orinoco	J. S. Garvin.
Osmanli	C. O'Hagan.
Ovingham	M. S. Stephenson.
Hay. Pajama	C. O. Rockwell.
Br. Palestine	W. Whiteway.
Parisian	J. Ritchie.
Pavonia	A. McKay.
Dtch. P. Caland	W. Ponsen.
Br. Peconic	G. Evans.
Peruvian	J. W. Wallace.
Picqua	J. T. Lund.
Pocasset	J. Jenkins.
Ger. Polaria	F. Schroder.
Polynesia	G. Franck.
Br. Polynesian	A. C. Whyte.
Pontiac	R. Blythe.
Ger. Preussen	C. Pohle.
Br. Prussian	C. H. Calvert.
Red Sea	Chas. Baker.
Ger. Rhaetia	H. Vogelgesang.
Rhein	W. Kuhlmann.
Rhenania	C. Schaffer.
Belg. Rhynland	R. Weyer.
Br. Rialto	J. Akester.
Richmond	E. S. Clapp.
Richmond Hill	H. H. Perry.
Ripon City	J. Brotchie.
Ronan	E. Maddox.
Rosarian	D. McKillop.
Ross-shire	W. Hewat.
Rossmore	J. Inch.
Dtch. Rotterdam	H. C. v. d. Zee.
Br. Roxburgh Castle	A. Turpin.
Ger. Rugia	R. Karlows.
Russia	A. Scheel.
Saale	H. Richter.
Br. Sacrobosco	H. Gibb.
Saint Ronans	H. Campbell.
Salerno	B. H. Rogers.
Samaria	T. Hewitson.
Am. Santiago	J. B. Allen.
Br. Sarnia	J. Gibson.
Ger. Scandia	E. Koopf.
Br. Scandinavian	J. Park.
Br. s. s. Scythia	T. Roberts.
Am. Seneca	F. Stevens.
Br. Servia	H. Walker.
Siberian	R. P. Moore.
Sicilia	W. R. Prideaux.
Nor. Sif	H. Bentzon.
Br. State of Indiana	A. Ritchie.
State of Nebraska	A. G. Braes.
State of Nevada	J. A. Stewart.
State of Pennsylvania	A. J. A. Mann.
State of Texas	G. Williams.
Strabo	A. Matheson.
Ger. Strassburg	F. Rodenberg.
Suevia	C. Ludwig.
Belg. Switzerland	J. Ueberweg.
Br. Texan	T. T. King.
Thanemore	A. J. Baxter.
Dan. Thingvalla	S. T. H. Laub.
Br. Thurston	T. Douglas.
Timor	W. Hodgson.
Toronto	J. MacAuley.
Tower Hill	R. Bennett.
Nor. Tordenskjold	C. Uehermann.
Ger. Trave	W. Willigerod.
Br. Tresco	J. R. Barber.
Trinidad	W. J. Fraser.
Ulunda	T. Clark.
Umbria	W. McMickan.
Vandyck	T. Phelan.
Venetian	E. Parry.
Venezuelan	A. H. Highton.
Swed. Victoria	J. A. Kinnman.
Br. Viola	L. Murray.
Virginian	W. C. Fry.
Belg. Waesland	C. H. Grant.
Ger. Werra	R. Bussius.
Weser	H. Bruns.
Belg. Westernland	J. C. Jamison.
Br. William Cliff	C. Winder.
Wisconsin	J. P. Worral.
Wylo	T. Rogers.
Wyoming	C. L. Rigby.
United States Naval.	
U. S. F. C. Albatross	Z. L. Tanner.
U. S. S. Despatch	W. S. Cowles.
U. S. C. S. schr. Eagre	W. P. Elliott.
U. S. C. & G. S. schr. Earnest	J. N. Jordan.
U. S. C. S. Endeavor	A. L. Hill.
U. S. C. S. Gedney	J. M. Helm.
U. S. S. Independence	J. W. Philip.
U. S. C. & G. S. McArthur	D. H. Mahan.
U. S. S. Minnesota	G. C. Wiltse.
U. S. S. Monongahela	G. C. Wingate.
U. S. S. New Hampshire	F. J. Higginson.
U. S. S. Ranger	G. C. Reiter.
U. S. S. Thetis	H. Stockton.
Sailing vessels.	
Am. bg. Abbie Clifford	D. W. Storey.
Nor. bk. Agatha	C. F. C. Rohr.
Ger. Agnes	Hirdes.
Nor. Aljuca	J. Andersen.
Am. Anita Berwind	A. J. Biddle.
bkt. Bonnie Doon	Chas. Burgess.
Ger. bk. Chas. Luling	C. Wiche.
Am. Crescent	J. W. Bartlett.
Br. C. S. Parnell	R. McLaughlin.
bg. Diadem	J. Crasso.
Am. Edith	W. G. Foster.
sp. El Capitan	H. W. Humphreys.
schr. Florence Randall	J. L. Randall.
Florence Leland	F. V. Watts.
Fred. E. Sander	Chas. Ross.
Br. sp. Glenfinart	W. Stirrat.
Ger. bk. G. N. Wilcox	W. Rasch.
Am. bkt. Golden Sheaf	W. Chandler.
Am. schr. Harold C. Beecher	J. E. Nickerson.
Br. bgt. Hattie Louise	W. H. Barnard.
Am. bg. H. B. Hussey	G. W. Hodgdon.
Br. bk. Iodine	Adam Smith.
Am. yacht Iroquois	R. N. Ellis.
schr. Jennie S.	Chas Sinclair.
bkt. John J. Marsh	F. P. Whittier.
schr. John R. Bergen	W. H. Squires.
Pilot-boat Jos. F. Loubat	J. M. McCarthy.
Br. bg. Julia Blake	J. Rudois.
Am. bk. Julia Rollins	J. I. Johnson.
Kennard	J. A. Bettencourt.
sp. Light vessel No. 45	Andrew Jackson.
schr. Longfellow	N. H. Falker.
Br. bk. Mabel	W. Johns.
sp. Mabel Taylor	Chas. E. Durkee.
Ger. bk. Margarethe	E. Suppher.
Span. bgt. Maria	J. C. Tomas.
Am. schr. Mary O'Neill	J. E. Creighton.
Aust. bk. Mattes	G. Vidulich.
Am. Matanzas	B. F. Rice.
schr. Maud H. Dudley	D. W. Oliver.
Br. schr. Molega	James Lohnes.
Ger. bk. Nanny	B. H. Muller.
Am. schr. Nelson Bartlett	J. S. Watts.
bk. Neptune	J. F. Hill.
Br. schr. Nutwood	J. R. Conroy.
Am. Otello	M. J. Bond.
Ger. bk. Pillau	G. Gerlach.
Nor. Poseidon	T. Boresen.
Dan. bk. Rialto	L. P. Jorgenson.
Am. bg. Robert Mowe	W. Peterson.
Br. bg. Solario	A. Reymer.
Am. T. Towner	C. E. Dayton.
Br. sp. Troop	D. W. Corning.
bgt. Ubaldiena	H. F. Schive.
bk. Valona	H. Andrews.
It. Vittoria	B. Scarpati.
Am. schr. Wm. F. Green	W. E. Crockett.
schr. Wm. Wilson	C. W. Powell.
Nor. Ystawa	J. Svenningsen.
Br. bk. Zimi	D. Lloyd.

UNITED STATES SIGNAL SERVICE

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INTRODUCTION.

This REVIEW is based on reports for January, 1890, from 1,934 regular and voluntary observers. These reports are classified as follows: 166 reports from Signal Service stations; 120 monthly reports from United States Army post surgeons; 1,270 monthly reports from state weather service and voluntary observers; 25 reports from Canadian stations; 353 marine reports through the co-operation of the Hydrographic Office, Navy Department; marine reports through the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Arkansas, Colorado, Illinois, Indiana, the Iowa Weather Crop Bulletin Service, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Meteorological Report of the Missouri State Board of Agriculture, Nebraska, Nevada, New England, New Jersey, New York, North Carolina, North and South Dakota, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, and Texas, and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used. Snow blockades or floods prevented the forwarding of reports of the Central Pacific Railway Company, and the rainfall observations of the United States Geological Survey in the southern plateau region, in time to be used in this issue of the REVIEW.

CHARACTERISTICS OF THE WEATHER FOR JANUARY, 1890.

The most disastrous storms of the month occurred from the middle Mississippi valley to the Great Lakes and thence eastward to New England during the 12th and 13th, within the area of a low pressure storm which first appeared as a feeble disturbance in the middle Rio Grande valley the night of the 11th, and thence moved northeastward with greatly increased energy, passing over the middle Mississippi valley to Lake Michigan during the 12th, over Michigan and Lake Huron during the night of the 12–13th, and east-northeast over Canada during the 13th. Destructive local storms occurred at distances varying from one hundred and fifty to three hundred miles to the southward of the centre of the main cyclone on the afternoon of the 12th. At Saint Louis, Mo., and Clinton, Ky., lives were lost, many persons were injured, and much property was destroyed by tornadoes. Great destruction was also caused at other places in western Kentucky, notably at Wickliffe and Moscow, and at other points in the Ohio and middle Mississippi valleys. On the 12th heavy snow storms, with high wind and falling temperature, occurred in Minnesota, the Dakotas, Kansas, Nebraska, and Iowa. In Minnesota, the Dakotas, Nebraska, and Kansas the snow drifted heavily and caused a general blockade to railroads. On the 12th and 13th the storm along the lower lakes and in parts of New York and New England was one of the severest experienced in many years, and was attended by fatalities and great destruction of property. In January, 1889, a severe storm, which followed a similar track to that pursued by the storm above referred to, advanced from southern Texas northeastward over the middle Mississippi valley, lower Lake Michigan, Michigan, and Lake Huron, and thence eastward north of the Saint Lawrence River from the 7th to 10th. This storm was attended by numerous local storms of unusual violence from the middle Mississippi valley eastward, and very destructive gales in the Ohio Valley, the Lake region, the middle Atlantic states, and New England. Over the north Atlantic ocean the storms of January, 1890, were exceptionally severe, more especially over mid-ocean, where heavy gales prevailed throughout the month.

The highest temperature reported for the month was 97°, at Fort Ringgold, Tex., and the lowest temperature noted was —42°, at Martindale, Mont. The month was warmer than the average January east of the Rocky Mountains, except in Minnesota and the upper Missouri valley, and was colder than usual on the Pacific coast, over the middle and northern plateau regions, and near the Gulf of Saint Lawrence. The greatest departures above the average temperature occurred in the middle Atlantic states south of New York, at Lake Erie stations, and in the Ohio and lower Mississippi valleys, where they exceeded 10°; the highest mean temperature ever reported for January was noted along the Atlantic and east Gulf coasts, and in the southern plateau region; and at a number of the older established Signal Service stations in New England, the middle and south Atlantic states, the Florida Peninsula, the Gulf States, the Ohio Valley and Tennessee, the Lake region, the upper Mississippi and lower Missouri valleys, and the southern plateau region, the absolute maximum temperature was the highest ever reported for January. The greatest departures below the average temperature were noted in northern Montana and the British Possessions to the northward, where they were more than 10°, and at stations in northern Montana, northern Nevada, and California it was the coldest January on record. Unusually heavy frost was reported at Keeler, Cal., on the 6th, and frost injured vegetation in southern Louisiana on the 16th and 17th.

The heaviest precipitation reported was 33.40 at Upper Mattole, Humboldt Co., Cal., and the precipitation amounted to 20.00, or more, in eastern California between the thirty-eighth and fortieth parallels, and in a small area on the west-central coast of California. In southwestern Washington, western Oregon, northwestern California, east-central Arkansas, south-central Indiana, south-central Illinois, southeastern Missouri, and east-central Texas the precipitation exceeded ten inches. In areas in southwestern Arizona, south-central Colorado, north-central New Mexico, northeastern South Dakota, and near the south coast of Great Salt Lake, Utah, no precipitation was reported. The precipitation was below the average for the month in the Atlantic coast and

east Gulf states, from the upper Lake region westward to eastern Oregon and Washington, and from the upper Missouri valley southward to eastern Colorado and central New Mexico; elsewhere the precipitation was in excess of the January average. The greatest deficiencies occurred on the North Carolina coast, where they exceeded five inches, and on the middle coast of the Gulf of Mexico, where they exceeded four inches. The greatest excesses were noted in the middle Mississippi and lower Ohio valleys, where they exceeded five inches, and where in central Indiana they were more than seven inches; and on the Pacific coast, south of the Columbia River, where they exceeded four inches, and where, at Los Angelos, Cal., they amounted to more than five inches. At stations in New York, Arkansas, Tennessee, Indiana, Ohio, Michigan, Minnesota, Illinois, Missouri, Indian Territory, Colorado, Utah, Washington, and southern California, the precipitation was the greatest, while at stations in Pennsylvania, Virginia, North Carolina, Georgia, Florida, Alabama, Louisiana, and North Dakota, it was the least ever reported for January. The greatest depth of snowfall reported for the month was two hundred and twenty-nine inches at Cisco, Cal.; one hundred and ninety-four inches were reported at Towle's, Cal., and one hundred and sixty-nine inches at Emigrant Gap, Cal. During the latter half of the month about one hundred and twenty miles of the Central Pacific Railroad crossing the summit of the Sierra Nevada range of mountains was blockaded by snow. This was the heaviest snow blockade ever known on the Central Pacific Railroad. In the northern counties of Nevada the excessive snowfall entailed great loss to the cattlemen, and it is estimated that fully fifty per cent. of the live stock was lost on account of starvation and exposure.

Destructive floods occurred in the early part of the month in southern Missouri, eastern Arkansas, and northern and eastern Texas, destroying property to the value of millions of dollars, and streams in south-central and western Illinois and southern Indiana overflowed their banks, causing much damage to property and loss of live stock. About the middle of the month the smaller streams in western Pennsylvania and West Virginia overflowed their banks, doing much damage. During the latter part of the month warm rains melted a large amount of snow in the Sierra Nevada and Siskiyou mountains in northern California, causing streams to overflow, washing away railroad bridges and levees, filling cuts, flooding towns, and causing land-slides, and in the San Joaquin Valley and southern California heavy rains caused streams and canals to overflow, causing washouts, and flooding large tracks of country. Navigation was not entirely suspended on Lakes Michigan and Ontario, where the trips made by vessels were the latest on record, and the Straits of Macinac were still open to navigation on the 31st.

A remarkable feature of the month was the enormous quantity of Arctic ice encountered near Newfoundland and the Grand Banks. Ice records for the last eight years show that but small quantities of Arctic ice have been reported for January in the region referred to during that period, and that during the present winter there has been practically no interruption of the southward flow of icebergs and field ice from the region north of Newfoundland.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for January, 1890, as determined from observations taken daily at 8 a. m. and 8. p. m. (75th meridian time), is shown on chart ii by isobars. The difference between the mean pressure for January, 1890, obtained from observations taken twice daily at the hours named and that determined from hourly observations, varied at the stations named below, as follows: At Boston, Mass., New York City, Washington City, Savannah, Ga., Buffalo, N. Y., Cincinnati, Ohio, Saint Louis, Mo., New Orleans, La., and Galveston, Tex., the mean of 8 a. m. and 8 p. m. observations was higher by .009, .010, .010, .007, .002, .005, .001, .001 and .003, respectively, and at Saint Paul, Minn., Dodge City, Kans., Denver, Colo., Santa Fé, N. Mex., Salt Lake City, Utah, and San Francisco, Cal., the mean of the observations taken at these hours was lower by .001, .006, .006, .012, .002, and .013, respectively, than the true mean pressure. At Chicago, Ill., and Memphis, Tenn., the mean pressure obtained from the 8 a. m. and 8 p. m. observations corresponded with that determined from hourly observations.

For January, 1890, the mean pressure was highest from the Atlantic coast between the twenty-eighth and thirty-fifth parallels northwestward to eastern Tennessee, where it rose above 30.30, the highest mean reading, 30.34, being noted at Augusta, Ga. From this region there was a decrease in mean pressure northeastward to eastern Nova Scotia, where it fell below 30.05, and northward to the northern part of the upper Lake region, where the mean values were below 30.10. An area of relatively high mean pressure occupied the middle Missouri valley, with included readings above 30.25, whence there was a gradual decrease in mean pressure westward to the area of lowest mean pressure for the month, which occupied the north Pacific coast, where, from the mouth of the Columbia River northward, the mean values fell below 29.85.

A comparison of the pressure chart for January, 1890, with that of the preceding month shows that there has been an increase in pressure over the entire country, save along the immediate west Gulf coast where the means for the current month corresponded with, or were slightly lower than, those for December, 1889. The most marked increase in pressure occurred in the middle and upper Missouri and Saskatchewan valleys, where it amounted to more than .20 of an inch. In the current, as in the preceding month, the mean pressure was highest over the south Atlantic and the more eastern of the eastern Gulf states, and the increase in mean pressure in that region was about .05 of an inch. The lowest mean pressure, for each of the months referred to, was noted on the north Pacific coast, where the changes were slight. A notable feature in connection with the pressure changes was the appearance, for the current month, of an area of high pressure over the middle Missouri valley, with values above 30.25, where, for December, 1889, the mean readings averaged about .20 of an inch lower.

The mean pressure was generally above the normal east of the Rocky Mountains, except in the lower Rio Grande valley; it was also above the normal on the south Pacific coast and over the southern plateau region. The mean pressure was below the normal along the middle and north Pacific coasts, over the middle and northern plateau regions, and over northwestern Montana and the British Possessions to the northward. The greatest departures above the normal pressure were noted in North Carolina and Georgia, where they amounted to .16 and .15 at Charlotte and Augusta, respectively, and the most marked departures below the normal pressure occurred on the north Pacific coast, where they equalled or exceeded .15 near the mouth of the Columbia River.

BAROMETRIC RANGES.

The monthly barometric ranges at the several Signal Service stations are shown in the table of miscellaneous meteorological data. The general rule, to which the monthly barometric ranges over the United States are found to conform, is that they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. In January, 1890, the monthly ranges were greatest over the northeastern part of lower Michigan and in eastern New England, where they exceeded 1.50, whence they decreased southward to less than .20 over southern Florida, to less than .30 along the east Gulf coast, and to less than .70 on the west Gulf coast, and

westward to less than .70 in southeastern Wyoming, whence they increased to more than 1.10 on the north Pacific coast. Along the Atlantic coast the monthly ranges varied from .15 at Key West, Fla., to 1.59 at Eastport and Portland, Me., and Nantucket, Mass.; between the eighty-second and ninety-second meridians, .25 at Cedar Keys, Fla., to 1.55 at Alpena, Mich.; between the Mississippi River and the Rocky Mountains, .66 at Cheyenne, Wyo., and .67 at Galveston, Tex., to 1.38 at Moorhead and Saint Vincent, Minn.; in the Rocky Mountain and plateau regions, .44 at Fort Grant, Ariz., to 1.16 at Walla Walla, Wash.; on the Pacific coast, .49 at San Diego, Cal., to 1.17 at Fort Canby, Wash.

A notable feature of the distribution of mean pressure for the month was the unusually large range in pressure from the Atlantic to the Pacific coasts. On the north Pacific coast the mean pressure was more than .15 below the normal, and on the south Atlantic coast the mean readings were more than .15 above the normal for January, giving a range of more than .45 between the Atlantic and Pacific coasts, and a range of more than .40 between the middle Missouri valley and the Pacific coast. The greatest ranges in mean pressure previously noted for January occurred in 1886, when there was a range of more than .40 between an area of high pressure over Manitoba and an area of low pressure on the north Pacific coast, and in January, 1888, when there was a range of more than .50 between an area of high pressure over the Missouri Valley and an area of low pressure over the Gulf of Saint Lawrence, and a range of more than .30 from the Missouri Valley to the north Pacific coast.

AREAS OF HIGH PRESSURE.

Eight areas of high pressure were observed during the month of January within the limits of the stations of observation, seven of which first appeared in the northern Rocky Mountain region, and the eighth moved southeastward from the Hudson Bay region over northern New England. The areas first observed in the northern Rocky Mountain region moved southeastward until the centre of greatest pressure reached the central Mississippi valley, none passing to the south of the thirty-sixth parallel of latitude. In passing over the eastern half of the continent the direction of movement was generally to the eastward, with an inclination to the north of east as the centre approached the coast. All passed off the coast to the north of Cape Hatteras, except one of minor importance which covered the plateau regions and disappeared by gradual decrease of pressure. The average rate of movement was thirty-one miles per hour, while the maximum rate was fifty-four and the minimum eleven miles per hour. Generally the areas of high pressure observed during the month were of less intensity than those usually observed during January; they were also less numerous and their mean track was farther to the north than usual. The following is a general description of the more marked meteorological features attending each area of high pressure during its transit over the region of observation:

I.—The month opened with this area central far to the north of Montana, while a barometric trough extended from Lake Superior southward to Texas. The pressure continued to increase in the extreme northwest during the 1st and 2d, when the maximum, 31.12, occurred in the Saskatchewan Valley, which was the highest barometric reading observed during the month. This high area extended slowly southeastward over the upper Mississippi and Missouri valleys during the 3d and 4th, the centre of greatest pressure remaining north of the stations of observation. An area of low pressure moved eastward from the California coast over the plateau region and a second depression developed over the Lake region, and were apparently forced to the south and eastward, respectively, as this high area advanced to the south and eastward during the 5th and 6th. While the movement of the principal area was to the southeastward over the Missouri Valley, the secondary formed to the eastward north of the Lake region during the night of the 3d and passed southeastward over the Saint Lawrence Valley and New England, disappearing to the east of the coast line during the 5th. In its movement southward this area was apparently divided, one portion covering the eastern slope of the Rocky Mountains while the other moved slowly southward, covering the plateau regions. These conditions continued until the 7th, when the more easterly area disappeared, apparently uniting with the one then central over southern Idaho, which remained almost stationary until the 10th, when it was replaced by an area of low pressure.

II.—The 8 p. m. weather chart of the 9th gave the first indication of the advance of this area from the north of the Saint Lawrence Valley. The a. m. report of the 10th indicated that the centre was passing southeastward and was near to and northwest of Father Point, Quebec. The cold northerly winds which prevailed over New England on the 10th and 11th were attended by snow, but the temperature rose rapidly as this area passed eastward during the 12th.

III.—Was central north of Montana on the 10th. It moved rapidly southward, covering the entire Rocky Mountain regions by the 12th, attended by one of the most pronounced cold waves observed during the month. It was preceded by an area of low pressure which formed over Texas and passed rapidly northeastward over the lakes, and a combination of these conditions resulted in unusual temperature gradients over the central Mississippi valley. On the afternoon of the 12th the temperature was above 60°, with rain in eastern Missouri, while it was snowing with a temperature of 12° in western Missouri. Destructive local storms occurred on Sunday, the 12th, in the central valleys, and the wind increased greatly in force when it shifted to westerly, a maximum of fifty-six miles per hour occurring at Saint Louis, Mo., 48 miles at Cairo, Ill., and 44 miles at Springfield, Ill., during the night of the 12th. On the morning of the 13th this area covered the regions from Texas northward to the Missouri Valley. It passed eastward over the central valleys on the 13th, and over the middle Atlantic states and New England on the 14th, attended by lower temperature, but the thermal changes were much less in the eastern portions of the United States than those previously referred to.

IV.—Was central north of Montana on the 14th, when an area of low pressure was moving eastward over the Rocky Mountain region. The cold air from this area moved rapidly southward over the Rocky Mountain regions and eastern slope, forcing the depression rapidly eastward over the Lake region, and causing a cold wave to extend southward to the Gulf coast, where the temperature fell to freezing on the 16th and 17th. The highest pressure remained north of Montana until the morning of the 16th, when this area covered the central valleys, the maximum pressure being 30.79 at Leavenworth, Kans. A norther occurred over Texas and extended eastward over the Southern States, although the temperature did not fall to freezing in northern Florida. It was generally below freezing in Georgia and the other south Atlantic states. The movement of this area was directly east from Missouri to the middle Atlantic coast. It covered the eastern portion of the United States on the 17th and 18th, attended by generally fair weather. The centre passed to the east of the coast line on the 17th, when the temperature rose slowly over the eastern half of the United States, attending the movement of this area to the eastward over the Atlantic.

V.—Appeared to the north of Idaho on the 16th where it remained almost stationary until the 20th, after which it passed rapidly southeastward over Montana to eastern Nebraska, where it was central on the morning of the 21st, causing a cold wave generally over the states of the Mississippi and Missouri valleys. The fall in temperature was most marked and sudden from Missouri southward to Texas and northern Louisiana. The centre of greatest pressure passed from eastern Nebraska to northern Indiana from the 21st to the 22d, the area being extended and covering the entire country east of the Rocky Mountains. On the morning of the 23d it had reached the middle Atlantic coast, but the pressure was

decreasing rapidly, owing to the advance of a storm from the upper lake region.

VI.—When the preceding area covered the eastern portion of the United States, number vi was advancing from the region north of North Dakota, and a slight area of low pressure was over eastern Dakota, separating the two areas of high pressure. The atmospheric movement was unusually rapid during the 23d. The low pressure above referred to moved eastward over the lakes and developed considerable energy, while the high area moved rapidly southward, covering the central valleys and extending southward to the Gulf coast by the afternoon of the 23d. Although the movement was rapid and the area well defined, it was not attended by unusual changes in temperature. After reaching the lower Missouri valley it moved eastward, following the general course of those previously described, reaching the lower Ohio valley on the 24th and eastern North Carolina on the 25th. It disappeared apparently by a gradual decrease of pressure, as the easterly movement apparently ceased when the centre reached the Atlantic coast.

VII.—Although the pressure was relatively high over the central plateau and Rocky Mountain regions on the 26th, reports indicate that this area developed to the north of Manitoba previous to the 27th, during which date it passed over Minnesota and thence eastward over the upper lake region, extending southward to the Gulf and south Atlantic states. It was attended by generally fair weather, but produced no marked changes in temperature. As it approached the south Atlantic states strong northeasterly gales occurred from Hatteras, N. C., southwestward over Florida, while northerly gales occurred on the Atlantic coast north of Hatteras.

VIII.—This area probably developed on the Pacific coast north of the stations of observation. At 8 p. m. on the 29th a well-marked area of low pressure covered Montana, with heavy snows to the north of that state and general rains on the Pacific coast. The telegraphic reports of the 30th indicated a rapid increase in barometric pressure at northern Rocky Mountain stations, and on the following day this area had moved southeastward, covering the northwestern states at the close of the month.

AREAS OF LOW PRESSURE.

Twelve areas of low pressure appeared within the field of observation during the month of January. The average rate of movement of these areas was unusually rapid, being forty miles per hour, while the maximum was fifty-four and the minimum twenty-two miles per hour. The general direction of movement was easterly while passing over the eastern half of the continent, those appearing in the higher latitudes moving more directly to the east than those farther to the southward. The direction of movement on the Pacific coast was also to the eastward, but in passing over the Rocky Mountain range there was an apparent tendency to change direction to the southward, this southern movement being usually attended by areas of high pressure to the north or northeast of the depression. The mean track of these areas was to the north of those usually observed in January, no area of low pressure having been traced south of the forty-second parallel and east of the Mississippi, while only one appeared on the eastern slope of the Rocky Mountains south of Kansas.

The following is a general description of the weather conditions attending these depressions:

I.—At the opening of the month this disturbance was apparently forming in the northern portion of a barometric trough which extended from Lake Superior southwestward to the Rio Grande Valley, while a second depression covered the central Rocky Mountain region. An area of high pressure and a cold wave to the north of Montana moved rapidly southward, causing this disturbance to increase in energy, and move rapidly to the eastward, and at the same time forcing the depression which was over the Rocky Mountain region to the westward. In moving eastward over the Lake region during the 2d, this depression was attended by heavy rains in the Ohio and lower Mississippi valleys and general rains throughout the eastern half of the country. The pressure decreased at the centre of disturbance during the easterly movement, the lowest observed barometric reading, 29.46, occurring at Anticosti, Gulf of Saint Lawrence, on the night of the 2d, where the barometer fell .64 of an inch in twelve hours. This storm was attended by high westerly winds in the Lake region, and strong southwesterly gales in the lower Saint Lawrence valley and in northeastern New England and off the New England coast.

II.—This disturbance developed in the north Pacific and was observed off the north Pacific coast during the 2d, although the location of the centre is not fixed until the afternoon of the 3d, when it was near the north California coast. There was an apparent southerly movement during the 2d and 3d, probably due to the presence of the extended area of high pressure which existed to the northeastward. On the 4th it passed over the central plateau region as an extended depression, but after reaching Colorado on the 5th it was forced southward over New Mexico, where it was quickly replaced by the advance of an area of high pressure from the northward.

III.—The 8 a. m. report of the 5th indicates that this disturbance had its origin near to and north of the upper lake region. It developed quickly in advance of a cold wave, and moved eastward to the Maritime Provinces at an average velocity of forty-four miles per hour. The rapid easterly movement of this depression was attended by a rapid decrease in pressure at the centre, the fall in the barometer at Chatham, N. B., in twelve hours during the 6th being .66 of an inch. It passed eastward over the Atlantic during the 7th, followed by northwesterly gales, the velocity at Anticosti, Gulf of Saint Lawrence, on the morning of the 7th, being fifty-two miles from the west. It was also followed by a cold wave in the Saint Lawrence Valley and northern New England on the same date.

IV.—This disturbance existed to the north of North Dakota on the 7th. Its movement eastward could be readily traced from telegraphic reports, but the location of its centre could only be approximately given, owing to the high latitude over which it passed. It was the most northerly disturbance traced during the month over the centre of the continent, but its course was to the south of east, which carried its centre over the Saint Lawrence Valley in the vicinity of Quebec where it was located on the afternoon of the 8th, on which date its influence was felt as far southward as the thirty-fifth parallel. Strong westerly gales occurred on the middle Atlantic and New England coasts and in the Lake region during the 8th and 9th. The weather cleared quickly over the Northern States as it passed eastward, and while the area of precipitation was large the amount was very slight. On the morning of the 9th the centre of disturbance was near Halifax, N. S., where the barometer was reported 29.12. The same reading was observed at Sydney, C. B. I., attended by easterly winds. This was apparently the most severe storm of the month off the New England coast, the wind reaching a maximum velocity of forty-six miles at Eastport, Me., and sixty-eight miles at Block Island, R. I.

V.—Was first observed far to the north of Montana on the 8th. It moved slowly southeastward, developing but slight energy, and becoming greatly extended in an east and west direction. On the morning of the 10th a barometric trough extended from Lake Michigan westward to Idaho, the barometer being lowest in northern Colorado. The 8 p. m. report of the 10th showed a well-defined area of low pressure covering Colorado, bounded by the line of 29.60, while the isobar of 29.70 also inclosed it, but extended to the eastward over Iowa and Missouri, the barometric gradient being very slight in the eastern portion of the disturbance, while it was much more marked to the north and northwest. The 8 a. m. report of the 11th exhibited a marked contrast between the meteorological conditions then existing and those reported eight hours previous. The centre of lowest pressure had been transferred from eastern Colorado to southern Wisconsin, where

the pressure had decreased .44 of an inch in twelve hours. While the track of number v, exhibited on chart i, indicates that this disturbance passed from eastern Colorado to the upper lake region in twelve hours, the reports from stations in the lower Missouri valley indicate that possibly a new development occurred during the night in this section and was forced to the northeastward, while the original disturbance moved southwestward and then southward over the Rio Grande Valley, finally resulting in conditions which favored the development of the storm which followed. This storm attained its maximum energy during the first twelve hours of its existence, and after reaching the Lake region it moved eastward, becoming greatly extended, and the pressure increasing rapidly at the centre. It passed over New England as a feeble disturbance during the night of the 11th, apparently becoming less clearly defined as it advanced eastward.

VI.—The barometer was low over the Rio Grande Valley on the 11th, while an extended body of cold air covered the northern and central Rocky Mountain slopes. This cold air moved southward to northern Texas by the morning of the 12th, while warm southerly winds prevailed over the states of the Mississippi Valley as far north as Missouri. On the morning of the 12th this disturbance was central in the eastern portion of Indian Territory, where the temperature was 68°, while in northern Texas it had fallen to 18°. During the following twelve hours it moved northward to the southern portion of Lake Michigan, where the barometer fell from 30.02 to 29.28, with a temperature above 60° from the Lake region southward to the Gulf, and below 20° over the eastern Rocky Mountain slope from Minnesota and the Dakotas southward to Indian Territory. This storm continued its northeasterly movement during the succeeding twenty-four hours, the pressure decreasing at the centre, but the inclosed area became more extended after passing the Lake region. It was attended by destructive local storms in the states of the central Mississippi and Ohio valleys, a dry norther in Texas, and gales in the Lake region and along the Atlantic coast. The minimum barometric pressure, 28.94, observed during its transit occurred at Anticosti, Gulf of Saint Lawrence, on the afternoon of the 13th.

VII.—This disturbance formed over the central plateau region during the 13th, replacing the area of high pressure which was central over that region during the night of the 12th. It first moved slowly southeastward, extending over the southern and central Rocky Mountain regions, and then rapidly eastward, covering the Mississippi Valley during the night of the 14th. The area of precipitation accompanying this disturbance included the entire country east of the Rocky Mountains. The principal area of low pressure moved eastward over the Lake region, while a secondary formed in the southern portion of the barometric trough, which, after passing eastward to the Mississippi Valley, was rapidly replaced by the area of high pressure which followed. After passing the lower lake region the barometer fell rapidly as the centre passed over New England and thence northeastward, the storm apparently reaching its maximum intensity during the night of the 16th, when central over Nova Scotia. Severe gales occurred on the Atlantic coast north of Hatteras, N. C., the winds reaching their maximum velocity after shifting to westerly. This disturbance passed to the east of Nova Scotia during the 17th, causing severe gales on the north Atlantic.

VIII and IX.—Was a slight disturbance which probably originated on the Pacific coast, or formed as a secondary over the plateau region during the 17th, following a severe storm which extended over the north Pacific coast during the two preceding days. After passing eastward to the central Rocky Mountain region during the 18th, it was apparently forced to the southward by an area of high pressure, and although the principal disturbance could not be traced after the 19th, the disturbance traced as number ix formed in the lower Missouri valley in the northeast portion of the barometric trough which attended this disturbance. The rapid southerly movement of cold air over the eastern slope of the Rocky Mountains apparently separated the secondary from the principal area of low pressure, and while the secondary moved northeastward with increasing energy, the former was replaced by an area of high pressure. The low area traced as number ix moved first to the northeastward over the upper lake region, apparently reaching its maximum energy while central north of Lake Huron, where the barometer fell from 29.92 to 29.36 during the night of the 20th. It passed rapidly eastward from this region, reaching northeast New England by 8 p. m. of the 20th, and it apparently increased in energy while passing over Nova Scotia. The a. m. report of the 21st indicated the lowest barometric reading observed during the transit of this storm, while the centre was to the east of, and near, Sydney, C. B. I.

X.—Formed over the central Rocky Mountain region on the 22d, the barometric pressure being at that time low on the north Pacific coast. It passed northeastward to Lake Superior on the 22d, where the direction of movement changed to the south of east, the disturbance passing over the Saint Lawrence Valley and New England on the 23d, after which it disappeared quickly to the eastward without causing any marked disturbance within the region of observation, although the winds attained a maximum velocity of forty-six miles on Lake Erie when the centre was near Toronto, Ont., and light snows occurred throughout the Lake region and in New England and New York.

XI.—This disturbance originated on the north Pacific coast, where the pressure was decidedly below the normal from the 21st to the 23d, attended by heavy rains from central California northward, and severe southerly gales on the north Pacific coast. The disturbance remained almost stationary until the 23d, after which it passed eastward to the Rocky Mountains and then southward to southeastern Montana, becoming greatly extended while passing over the eastern slope of the Rocky Mountains. On the morning of the 26th two centres of disturbance were observed, one over the upper Mississippi valley and the other over Colorado. The 8 p. m. report of the same date indicated that the disturbance over the upper Mississippi valley had passed eastward to the lower lake region as a feeble disturbance, attended by light rains, while that over Colorado had been replaced by an area of high pressure. This storm moved southeastward from the lower lake region to the southern New England coast, and probably this direction of movement continued beyond the coast line. It was followed by moderate gales from the north at stations on the coast from Hatteras, N. C., to Block Island, R. I., on the night of the 27th.

XII.—This storm also had its origin on the north Pacific coast, where it was central on the morning of the 29th. Heavy gales occurred on this coast during the preceding day, and the disturbance probably originated over the north Pacific. It passed rapidly eastward, and in twenty-four hours the centre had reached northern North Dakota. The easterly course continued during the 30th, and by the morning of the 31st it was central north of Lake Huron as a well-defined area of low pressure, including in its limits the northern states east of the Mississippi. General rains occurred in the lower lake region, New York, and New England, but the amount of precipitation was slight, and the northeasterly course of the storm carried it beyond the limits of the United States, causing the weather to clear rapidly over the rain-area previously named.

In the following consolidated table, showing the principal characteristics of the areas of high and low pressure which appeared over the United States and Canada during January, 1890, the dates upon which the respective areas of high and low pressure were first observed are given, together with the location of their centres when first and last observed, their duration, in days, and the maximum velocity of the wind during their passage. The second part of the table shows the maximum abnormal changes in pressure in twelve hours noted during the passage of each area of high or low pressure, together with the maximum abnormal changes in temperature, and the maximum velocity of the wind resulting therefrom. The pub-

lication in succeeding numbers of the MONTHLY WEATHER REVIEW of tables giving similar data will furnish valuable material for determining the normal movement, rate of progress, intensity, and duration of areas of high and low pressure, and a study of the record of abnormal pressure changes in connection with the abnormal temperature changes and maximum wind-velocities will be of great value in the current work of this office in calculating the changes in temperature and the maximum wind-velocity which will probably attend the eastern movement of areas of high and low pressure which appear over the western part of the country, and which are first located by the telegraphic reports of this Service.

TABLE I.

Barometer.	First observed.			Last observed.		Duration.	Velocity per hour.	Maximum abnormal changes in pressure in twelve hours, with maximum abnormal changes in temperature and maximum wind velocities in connection therewith.									
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.			Rise.	Station.	Date.	Fall.	Station.	Date.	Miles per hour.	Direction.	Station.	Date.
High areas.		°	°	°	°	Days.	Miles.	Inch.			°						
I	1	55	118	38	99	6.0	11	.46	Quebec, Quebec	7	44	Kansas City, Mo	5	30	nw.	Omaha, Nebr	5
Ia	3	50	79	40	70	1.0	38	.62	Father Point, Quebec	3	29	Keokuk, Iowa	2	46	nw.	Anticosti Island, G. of S. L	3
Ib	5	52	113	40	117	4.5	10	.34	Salt Lake City, Utah	7	24	Winnemucca, Nev	5	46	sw.	Ft. Assinniboine, Mont	7
II	10	53	74	43	60	1.5	30	.52	Anticosti Island, G. of S. L	10	37	Quebec, Quebec	9	40	ne.	Block Island, R. I.	10
III	10	55	112	43	63	4.5	41	1.10	Alpena, Mich	13	36	Indianapolis, Ind / Pittsburgh, Pa	13	48	nw.	Fort McKinney, Wyo	11
IV	14	54	112	41	63	4.0	24	.88	Yarmouth, N. S	17	29	Keokuk, Iowa / Rockliffe, Ont	15 / 16	56	nw.	Sandy Hook, N. J	17
V	16	56	117	37	77	7.0	17	.78	Parry Sound, Ont	20	44	Palestine, Tex	20	58	nw.	do	22
VI	22	55	107	35	77	2.5	41	.44	Saint Paul, Minn	23	26	Dubuque, Iowa	23	44	nw.	do	24
VII	27	53	100	36	76	2.0	40	.62	Cheyenne, Wyo	26	20	Moorhead, Minn	27	44	n.	Hatteras, N. C	28
VIII	30	54	121	48	97	1.0	54	.66	Sault de Ste. Marie, Mich.	31	43	Ft. Assinniboine, Mont	30	60	nw. / ne.	Atlantic City, N. J / Fort McKinney, Wyo	27 / 30
Mean		54	105	40	80	3.4	31	.64			33			47			
Low areas.								Fall.			Rise.						
I	1	47	93	49	55	2.0	42	.48	Chatham, N. B	1	36	Chatham, N. B	1	48	sw.	Sydney, C. B. I	2
II	3	40	125	33	105	3.0	22	.26	Cheyenne, Wyo	4	17	Cheyenne, Wyo	3	48	sw.	Fort Canby, Wash	3
III	5	48	83	48	55	1.5	44	.66	Chatham, N. B	6	16	Toledo, Ohio / Sydney, C. B. I	5 / 6	52	w.	Anticosti Island, G. of S. L	7
IV	7	55	106	45	62	2.0	47	.54	Winnipeg, Man / Quebec, Quebec	7 / 8	30	Helena, Mont	7	68	nw. / w.	Block Island, R. I / Buffalo, N. Y	9 / 8
V	8	54	115	43	67	4.0	36	.58	Moorhead, Minn	9	28	Rochester, N. Y	11	56	w.	Cheyenne, Wyo	9
VI	11	30	100	52	66	2.0	54	1.18	Halifax, N. S	13	37	Montreal, Quebec	13	84	w.	Buffalo, N. Y	13
VII	13	40	111	46	62	3.5	30	.68	Yarmouth, N. S	15	16	Nashville, Tenn	15	54	nw.	Sandy Hook, N. J	16
VIII	18	41	116	39	104	1.0	30	.18	Cheyenne, Wyo	19	15	Fort Elliott, Tex	19	42	w.	Pueblo, Col	19
IX	19	40	94	47	57	2.0	45	.64	Halifax, N. S	20	20	Portland, Me	20	64	w.	Buffalo, N. Y	20
X	22	43	106	43	67	2.0	52	.52	Albany, N. Y / Marquette, Mich	23	28	Fort Sully, S. Dak	22	46	sw.	do	23
XI	23	50	125	40	71	3.5	37	1.00	Calgary, N. W. T	24	31	La Crosse, Wis	24	60	w. / sw.	Cheyenne, Wyo / Fort McKinney, Wyo	25 / 25
XII	29	48	125	50	71	2.5	46	.58	Father Point, Quebec	31	44	Medicine Hat, N. W. T	29	64	s.	Fort Canby, Wash	29
Mean		45	108	45	70	2.7	40	.61			26			57			

NORTH ATLANTIC STORMS FOR JANUARY, 1890 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during January, 1890, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Twelve depressions have been traced for January, 1890, the average number traced for the corresponding month of the last seven years being 9.7. The greatest number of depressions previously traced for January was twelve, in 1884 and 1887, and the least number was seven, in 1886. Of the depressions traced for the current month six advanced eastward over Newfoundland, three passed eastward between Newfoundland and the forty-second parallel, and three first appeared over the ocean. Of the nine depressions that moved eastward from the American continent, four were traced to the British Isles, as were also two of the storms which first appeared over the ocean. The depressions generally pursued a uniform east-northeast course, and, while the tracks were more southerly than during the preceding fall and winter months, no storms were located south of the fortieth parallel. Over the western part of the ocean the severest storms occurred on the 3d, 7th, 9th, 10th, 17th, and 28th, when the pressure fell to, or below, 29.00 (737), and the wind attained hurricane force; on the 14th, 21st to 23d, 25th, and 26th, heavy gales were reported in that region. At Saint John's, N. F., the gale of the 7th was accompanied by snow and rain; that of the 10th by a heavy snow storm; that of the 17th by snow, sleet, and rain; and on the 21st a blinding snow storm prevailed all day. Over mid-ocean severe storms prevailed throughout the entire month, the 4th, 5th, 15th to 18th, 22d to 24th, 28th, and 29th being dates for which pressure falling to, or below, 29.00 (737) and gales of hurricane force were noted; on the 24th pressure below 28.30 (719) was indicated, and an extreme reading of 28.08 (713) was reported. Stormy weather prevailed over and near the British Isles on the 3d to 6th, 9th, and 14th to 27th; on the 5th a heavy gale prevailed over Great Britain and Ireland, causing many wrecks and much damage; from the 18th to 26th the barometer continued very low over the British Isles, falling to 28.97 (736) at Leith, Scotland, on the 19th, on which latter date a terrific storm raged over Ireland and the more northern and western parts of Great Britain and caused much damage to property and shipping.

The movements of areas of high pressure over the north Atlantic Ocean during the month were as follows: On the 1st the pressure was highest over Nova Scotia, and an area of high pressure extended thence to the West Indies and the Azores. By the 2d the area of high pressure had settled southward and was central off the south Atlantic coast, where it remained until the 3d, and by the 4th the pressure was highest over the middle Atlantic states and the area of high pressure over the ocean had apparently contracted to the westward of the fiftieth meridian. By the 6th this area had moved to the vicinity of Bermuda, whence it apparently moved eastward. On the 10th an area of high pressure was central over the lower Saint Law-

rence valley, where it remained during that and the following date, and on the 12th the pressure was high along the entire Atlantic coast. By the 13th the area of high pressure had moved southeastward over Nova Scotia, and by the following date had apparently united with the area of high pressure over the Azores. From the 14th to 16th an area of high pressure advanced from the middle Atlantic coast to the Azores. On the 17th and 18th an area of high pressure extended along the Atlantic coast and the pressure was high over and near the Azores. During the 19th and 20th the area of high pressure moved from the Atlantic coast to the southward of the Azores. From the 22d to 25th the pressure was high over the southeastern part of the United States; by the 26th this area of high pressure had advanced eastward to about the sixtieth meridian, where it apparently disappeared by a decrease in pressure by the 28th. On the 29th the pressure was high along the Atlantic coast south of the fortieth parallel, and on the 30th an area of high pressure extended from the American coast to the Azores. On the 31st high pressure prevailed over the entire ocean south of the fiftieth parallel.

Among notable January storms of preceding years over the eastern part of the United States and off the Atlantic coast were the following: In 1878 a depression, which was first located south of the mouth of the Rio Grande River on the 6th, moved slowly east-northeast over the Gulf of Mexico and crossed Florida on the 9th, and thence advanced northeastward just off the coast line to the Maine coast by the morning of the 11th, whence it recurved to the eastward and passed over Nova Scotia by the 12th. While central over New England this was one of the severest storms ever known on the coast of the United States, along the whole extent of which innumerable wrecks occurred. At Mount Washington, N. H., a wind velocity of 186 miles per hour from the northeast was measured at 4 a. m. of the 11th. In this month a storm advanced from the lower Mississippi valley to the Georgia coast during the 30th, and thence moving northeastward off the coast was central off the New Jersey coast the night of the 31st. This storm was very severe along the coast, the wind attaining a velocity of 120 miles per hour at Kitty Hawk, N. C., at 2.20 a. m. of the 31st. Among other disasters the steamship "Metropolis" was wrecked on the North Carolina coast. In 1886 a storm, which first appeared in southern Texas on the 7th, moved to southern Alabama by the 8th, thence northeastward to the New Jersey coast by the morning of the 9th, and thence northeastward over New England to the lower Saint Lawrence valley by the 10th. This storm increased in energy as it passed over the Gulf States, and attained great violence as it moved northeastward along the Atlantic coast. At Boston, Mass., the barometer fell to 28.73 (730) during the afternoon of the 9th, to 28.72 (730) at Sandy Hook, N. J., at 9 a. m. of the 9th, and the gradient was steep in all directions, the pressure being 30.80 (782) in Minnesota and Dakota. The storm developed its maximum energy while passing along the middle Atlantic coast; after passing over New England the winds decreased in force. This storm was followed by one of the most widespread and intense cold waves ever experienced over the United States east of the Rocky Mountains.

Compared with the corresponding month of the last seven years the weather along the trans-Atlantic steamship routes during January, 1890, was exceptionally severe. The low pressure storms which advanced eastward from the American continent exceeded in number and energy the January average, and by their uniform movement towards the European coast, which an unusually large proportion of them reached, caused continuously low pressure over mid-ocean and prevailingly low pressure over and near the British Isles.

The following are brief descriptions of the depressions traced for January, 1890:

1.—On the 1st and 2d an area of low pressure was central north of the region of observation between the fifteenth and thirtieth meridians, whence it moved eastward and disappeared north of the British Isles after the 3d, with pressure falling below 29.40 (747) and fresh to strong gales.

2.—This depression was a continuation of low area i, which moved eastward over the Saint Lawrence Valley during the 2d. By the 3d the centre of depression had advanced over northern Newfoundland to north of the Grand Banks, with pressure about 29.00 (737) and gales of hurricane force. Passing thence east-northeast the storm-centre reached the twentieth meridian by noon, Greenwich time, of the 5th, its progress being attended by fresh to strong gales, and on the 4th by gales of hurricane force and pressure falling below 28.70 (729). By the 6th this depression had apparently moved northeastward beyond the region of observation.

3.—This depression first appeared over mid-ocean, and on the 6th was central between the twentieth and thirtieth meridians, with pressure falling below 29.20 (742) and strong to whole gales, after which it passed beyond the region of observation, apparently following in the wake of depression 2.

4.—This depression was a continuation of low area iii, which advanced from the Lake region to Nova Scotia during the 6th. By the 7th the storm-centre had passed over southern Newfoundland, with pressure below 29.00 (737) and heavy gales, and thence moving north of east disappeared over the British Isles east of the region of observation after the 9th, attended by strong to whole gales over the ocean.

5.—This depression was a continuation of low area iv, which was central over eastern Nova Scotia the morning of the 9th. By the 10th the centre of depression had moved northeast over Newfoundland to about the forty-fourth meridian, and thence passed to the twenty-fifth meridian in about N. 57° by the 11th, after which it disappeared north of the region of observation. This depression was attended on the 9th and 10th by pressure falling below 29.00 (737) and gales of hurricane force, after which there was an apparent loss of energy, although strong to whole gales continued over mid-ocean during the 11th and 12th.

6.—This depression was a continuation of low area vi, which advanced from north of the Lake region to Nova Scotia during the 13th. By the 14th the storm-centre had moved northeast over Newfoundland to about the forty-eighth meridian, with pressure below 29.40 (747) and fresh to strong gales. During the next three days the depression passed east-northeast to the fifteenth meridian, and disappeared north of the British Isles after the 17th. From the 15th to 17th the depression was attended by heavy gales, attaining hurricane force on the 15th and 17th, and pressure falling below 29.00 (737); on the 18th by pressure falling below 29.00 (737) north and northwest of Ireland; and on the 19th by pressure falling to 28.79 (731) at Leith, Scotland, on which latter date destructive storms prevailed over the British Isles.

7.—This depression was a continuation of low area vii, which was central over New England on the 16th. By the 17th the depression had advanced over Newfoundland, with pressure falling to 28.82 (732) at Saint John's, N. F., and gales of hurricane force over the ocean, after which it apparently moved rapidly east-northeast and united with an extensive area of low pressure which occupied the eastern part of the ocean.

8.—This depression was a continuation of low area ix, which advanced from the upper lake region to Nova Scotia during the 20th. By the morning of the 21st the centre of depression had moved to the south of Newfoundland, with pressure below 29.27 (742) and heavy gales, whence it moved rapidly east-northeast to about the twenty-fifth meridian by the 22d, attended by strong to whole gales and pressure below 28.90 (734), after which it disappeared north of the British Isles without evidence of diminished energy.

9.—This depression apparently orignated east of the Banks of Newfoundland and was central on the 23d in about N. 48°, W. 38°, with pressure below 29.00 (737) and gales of hurricane force, whence it moved northeast to about the twenty-ninth meridian by noon, Greenwich time, of the 24th, on which latter date the pressure was probably the lowest and the storms

the severest of the month over mid-ocean. On this date an extreme low barometer reading of 28.08 (713) was reported near the storm's centre, and terrific hurricanes were encountered east of the fortieth meridian.

10.—This depression was a continuation of low area x, which was central off the southern coast of Nova Scotia on the morning of the 24th. By the 25th the storm-centre had moved eastward over the Grand Banks, attended by fresh gales, after which it apparently passed rapidly northeastward and united with an extensive area of low pressure which occupied the ocean east of the thirtieth meridian.

11.—On the morning of the 26th this storm was central south of Newfoundland, whence it moved northeast and disappeared north of the region of observation after the 27th without evidence of marked energy.

12.—This depression was a continuation of low area xi, which was central off the New England coast on the morning of the 27th. By the 28th the depression had moved eastward to the fiftieth meridian, with pressure below 29.00 (737) and gales of hurricane force, after which it passed rapidly northeastward beyond the region of observation without an apparent decrease in energy.

OCEAN ICE IN JANUARY.

Vast fields of Arctic ice and enormous icebergs were encountered over and near the Grand Banks north of the forty-third parallel throughout a greater part of the month. Within the period covered by the ice records of this office, which embraces the last eight years, the current month is by far the most remarkable January as regards the quantity of Arctic ice reported, and while it may be stated that the southward movement of icebergs and field ice was unprecedentedly early, and that a general and extensive movement of Arctic ice over the Grand Banks is not commonly inaugurated until the early spring months, it may also be remarked that during the present winter the southward movement of Arctic ice over the Banks of Newfoundland has been practically uninterrupted, and that, in the preceding as well as during the current month, the Arctic ice reported over and near the Grand Banks would compare, in quantity, with that noted during the spring and summer months, in which seasons it is, as a rule, most prevalent in that region. On the 15th large quantities of drift and field ice were reported between the south coast of Newfoundland and Cape Breton Island, and on the 25th, ice along the eastern coast of Newfoundland prevented steamers from reaching Saint John's. In the corresponding month of 1889 no Arctic ice was reported; in 1888, two bergs, one very large, were observed in N. 45° 20′, W. 50° 01′ on the 31st, and an ice bank was seen to the northward of that position; in 1887, a medium-sized berg was reported in N. 48° 30′, W. 46° on the 30th; in 1886, several icebergs were reported off the southeast coast of Newfoundland; in 1885, icebergs were reported between W. 45° 30′ and W. 42° 24′, none being observed south of the forty-seventh parallel; in 1884, icebergs were reported about four degrees farther west, and about eleven days later, on the 24th, than in January, 1885; in 1883, the first icebergs were reported in 47° 35′, W. 45° 04′ on the 30th; in 1882, the first icebergs were observed in N. 47° 30′, W. 48° 35′ on the 30th.

The following positions of icebergs and field-ice reported for January, 1890, are shown on chart i by ruled shading:

1st.—N. 47° 50′, W. 48° 05′, small berg, with two peaks.

5th.—N. 47° 16′, W. 44° 52′, two bergs, about one hundred feet high; N. 48° 10′, W. 48° 30′, berg from seven to eight hundred feet long and seventy feet high; N. 47° 19′, W. 45° 05′, large berg; N. 46° 45′, W. 48° 48′, medium berg.

6th.—N. 46° 24′, W. 48° 15′, large berg; N. 50° 20′, W. 44°, two small bergs; N. 47° 20′, W. 44° 27′, berg about eighty feet high; N. 48° 02′, W. 49° 15′, large berg, with detached pieces; N. 48° 12′, W. 49° 15′, large pieces of drift ice; N. 50° 08′, W. 43° 30′, two small bergs.

7th.—N. 48° 35′, W. 48° 45′, large berg and field ice; N. 48°, W. 49°, large berg; N. 45° 59′, W. 49° 09′, berg, four hundred feet long and one hundred feet high; N. 48°, W. 49°, fifteen miles of field ice.

8th.—N. 46° 01′, W. 48° 40′, enormous berg, about one-fourth of a mile long and two hundred feet high; N. 48° 34′, W. 48°, drift ice for ten hours; thence to Saint John's N. F., ice fields; N. 46° 40′, W. 44° 05′, berg twenty-five feet high and one hundred and thirty feet long; N. 46° 50′, W. 44° 10′, berg one hundred and thirty feet high and three hundred and twenty-five feet long.

9th.—N. 45° 25′, W. 48° 35′, two large blocks of ice; N. 46° 46′, W. 45° 08′, berg about six hundred feet long and one hundred and twenty feet high.

10th.—N. 47°, W. 47°, field of ice, extending northward; N. 46° 10′, W. 48° 16′, berg.

11th.—N. 46°, W. 47°, large berg; N. 45° 25′, W. 48° 16′, berg with three peaks; N. 47° 39′, W. 47° 47′, small quantity of field ice, and two small bergs.

12th.—N. 46° 01′, W. 47° 53′, one large and one small berg; N. 45° 32′, W. 48° 07′, small berg eighty feet high; N. 46° 01′, W. 46° 47′, small berg.

13th.—N. 46° 03′, W. 47° 47′, small piece of ice; N. 46° 18′, W. 47° 02′, large berg about two hundred feet high, and five hundred to six hundred feet long.

14th.—N. 46° 01′, W. 47° 53′, small flat iceberg; N. 46° 46′, W. 47° 22′, detached ice for an hour, field ice to the northward.

15th.—Steamer "St. Pierre" could not get into Sydney, C. B. I., on account of ice. She also passed a quantity of drift ice in the Gulf on her way across from Saint Pierre, N. F.

16th.—N. 45°, W. 48°, large berg; N. 46° 32′, W. 47° 07′, field ice to the northward.

19th.—N. 47°, W. 47°, field ice to northward; evening of same day a berg; N. 47° 56′, W. 48°, field ice studded with large bergs.

20th.—N. 47° 52′, W. 47° 52′, large quantities of drift ice, with one large and several small bergs; N. 47°, W. 50° 40′, field ice; N. 45° 53′, W. 41° 33′, berg one hundred and fifty feet high and two hundred and fifty feet long; N. 45° 48′, W. 41° 42′, berg sixty feet high and one hundred feet long, with two turrets; N. 46° 34′, W. 45° 02′, large berg about two hundred feet high.

20th–21st.—N. 46° 37′, W. 44° 58′, sloping berg two hundred feet high at one end and one hundred and fifty feet at the other, eight hundred feet long; N. 46° 03′, W. 46° 43′, large amount of closely packed field ice.

21st.—N. 46° 44′, W. 39° 40′, berg; N. 46° 15′, W. 47° 59′, large berg about four hundred feet long and fifty feet high; also several about three hundred feet long and forty feet high; N. 46° 38′, W. 44° 44′, high berg; N. 47° 30′, W. 46° 35′ to N. 46° 16′, W. 47° 13′, great quantities of ice and several large bergs; N. 47° 40′, W. 47° 40′ to N. 47° 07′, W. 48° 30′, field ice for fifty-six hours; N. 46°, W. 45°. bergs and field ice; N. 46° 50′, W. 46° 30′, berg about sixty feet high and four hundred feet long; N. 46° 15′, W. 47° 29′, bergs about forty feet high and three hundred feet long, and a densely packed field of ice twenty miles long; N. 46° 25′, W. 46° 36′, to N. 46° 06′, W. 47° 12′, berg twenty-five feet high and one hundred and sixty feet long, and heavy field ice to the northward; N. 46° 44′, W. 44° 35′, berg, large at the base and rising to a peak, sixty feet high; N. 45° 42′, W. 47° 58′, ten miles of field ice, ice thin and spongy.

22d.—East of Virgin Rocks, an ice pack for fifty-six hours; N. 44° 37′, W. 41° 28′, berg; N. 48°, W. 48°, field ice and heavy bergs; N. 45° 50′, W. 41° 30′, a large and a small berg.

22–23d.—N. 47° 27′, W. 45° 16′, double-peaked berg, forty feet high and one hundred and thirty feet long; large quantities of field ice and several small bergs awash.

23d.—N. 45° 54′, W. 48°, quantity of field ice; N. 46° 23′, W. 47° 25′ to N. 46° 11′, W. 48° 03′, fields of pack ice, twenty-nine miles long; N. 46° 44′, W. 48° 20′, entered field ice with several small bergs; N. 45° 44′, W. 46° 36′ to N. 45° 52′, W. 46° 46′, passed south of field ice; N. 45° 52′, W. 47° 33′, bergs and drift ice, the largest berg was one hundred feet high; N.

47° 33′, W. 47° 27′, light field ice; N. 45° 41′, W. 47° 36′, several small icebergs; N. 45° 10′, W. 48° 12′, three large bergs among field ice, one of which was about one-fourth of a mile long.

24th.—N. 45° 47′, W. 47° 17′ to N. 45° 47′, W. 47° 39′, three large bergs; N. 45° 27′, W. 47° 24′, one large and two small bergs; N. 45° 04′, W. 48° 21′, berg.

25th.—The whole eastern coast of Newfoundland was blockaded with ice. The steamers "Caspian" and "Miranda" were unable to get into Saint John's, N. F., on account of ice; N. 46° 17′, W. 47° 50′ to N. 45° 10′, W. 48° 14′, field ice and several bergs.

26th.—N. 46° 24′, W. 47° 28′, large berg three hundred feet long and two hundred feet high; N. 45° 59′, W. 47° 59′, two small bergs; N. 46° 15′, W. 47° 39′, large quantities of field ice; N. 46° 57′, W. 47° 42′, several small bergs and field ice; N. 45°, W. 51°, four bergs and field ice for four hours.

27th.—Thirty miles east of Scatari Island, heavy field ice, extending beyond view; N. 45° 17′, W. 47° 21′, two hummocks, estimated seventy feet out of water; N. 44° 50′, W. 48° to N. 45°, W. 49°, several floes of field ice; N. 46° 40′, W. 52° 55′, field ice; N. 44° 18′, W. 49°, large berg; N. 48° 30′, W. 48° 48′, two wide streaks of field ice; at 3.30 p. m., vessel completely jammed, engines stopped till 11.30 p. m.; N. 46° 13′, W. 41° 11′, field of ice, extending one hundred miles to the westward and as far north as could be seen.

27–28th.—N. 46° 10′, W. 47° 15′ to 45° 30′, W. 48° 40′, fields of ice; heavy packed ice and small bergs.

28th.—N. 44° 29′, W. 47° 40′, five large and several small bergs in fields of ice five to fifteen miles long; N. 46° 24′, W. 47° 29′, two bergs, and steamed for twelve hours through field ice; one hundred and thirty miles east of Saint John's, N. F., several large bergs; N. 44° 20′, W. 50°, field ice; N. 45° 06′, W. 58° 40′ to N. 44° 51′, W. 59° 40′, fields of ice.

29th.—N. 43°, W. 49° 35′, berg two hundred feet high and four hundred feet long; N. 45° 52′, W. 47° 59′ to N. 45° 22′, W. 49° 14′, continuous heavy field ice; N. 43°, W. 49° 10′, large berg; N. 44° 34′, W. 48° 40′, two bergs; N. 44° 29′, W. 47° 40′, large berg, one-half mile wide and one mile long.

29–30th.—N. 46° 50′, W. 46° 52′ to N. 45° 12′, W. 48° 50′, ice field.

30th.—N. 46° 50′, W. 46° 45′ to N. 45° 32′, W. 48° 15′, large fields of ice and several large and small bergs; N. 43° 19′, W. 48° 52′, very large berg; N. 45°, W. 47°, three bergs and large quantities of field ice.

31st.—N. 46° 05′, W. 47° 13′, large fields of densely packed ice and several bergs from one hundred to one hundred and fifty feet long and thirty to fifty feet high; N. 44° 38′, W. 60°, numerous streaks of field ice with a few large pieces; N. 43° 05′, W. 48° 56′, large berg about one hundred and fifty feet high.

FOG IN JANUARY.

The following are limits of fog-areas on the north Atlantic Ocean, west of the fortieth meridian, for January, 1890, as reported by shipmasters:

Date.	Entered.		Cleared.		Date.	Entered.		Cleared.	
	Lat. N.	Lon. W.	Lat. N.	Lon. W.		Lat. N.	Lon. W.	Lat. N.	Lon. W.
	° ′	° ′	° ′	° ′		° ′	° ′	° ′	° ′
5–6	42 18	61 21	43 16	58 15	14	44 18	49 20	44 11	50 01
5–6	31 25	80 07	31 56	80 29	16	42 57	57 36	42 56	58 03
5–6	31 47	80 46	Off Tybee Island.		15–16	38 42	72 32	38 30	73 02
6	41 30	64 00	41 20	64 35	15–16	42 51	64 54	41 21	66 59
6	41 30	65 17	40 59	66 30	16–17	43 55	58 00	43 22	60 00
6	44 02	61 06	43 31	62 45	16–17	44 15	50 35	43 45	51 58
6–7	43 22	57 03	43 58	54 37	27	42 27	60 05	42 04	61 48
7	42 31	50 31	42 56	48 57	27–28	43 00	58 08	42 25	60 19
12	42 18	68 40	42 15	64 36	30	41 30	65 00	41 20	65 05
12–13	40 39	66 40	40 32	69 49	31	41 25	65 20	41 05	68 10
13–14	42 52	61 52	42 50	62 59					

The limits of fog belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on four dates; between the fifty-fifth and sixty-fifth meridans on nine dates; and west of the sixty-fifth meridian on eight dates. Compared with the corresponding month of the last two years the dates of occurrence of fog near the Grand Banks numbered two less than the average; west of the fifty-fifth meridian the dates of occurrence of fog were two less than the average for the last two years. Over and near the Grand Banks fog was reported on the 7th, 14th, and 17th, with the approach and passage to the northward of areas of low pressure, and on the 16th, with the advance over New England and Nova Scotia of an area of low pressure. Between the fifty-fifth and sixty-fifth meridians fog was generally reported attending or following the passage to the northward of areas of low pressure, and was preceded or attended by rain. West of the sixty-fifth meridian fog generally occurred with south to east winds and rain, attending the approach or passage to the northward of areas of low pressure. Along the immediate coast of the United States fog was more generally noted on the 5th, when it occurred at Nantucket, Mass., and Block Island, R. I., in the evening, with an area of low pressure central over the Lake region; on the 6th at Portland, Me., and Boston, Mass., attending the passage of a storm-centre over New England; on the morning of the 12th at Nantucket and Wood's Holl, Mass., Block Island, R. I., New London, Conn., and New York City, with the passage of an area of low pressure from the Lake region over New England; and on the morning of the 13th at Nantucket, Wood's Holl, and Boston, Mass., Portland, Me., Block Island, R. I., New London, Conn., and Atlantic City, N. J., with the passage of an area of low pressure from the Lake region to Nova Scotia.

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for January, 1890, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

For January, 1890, the mean temperature was highest over southern Florida, where it was above 70°; the highest mean reading, 73°.4, being reported at Key West. The mean values were above 60° over southern Georgia and in the southern parts of the east and west Gulf states. South of a line traced irregularly south of west from the coast of Virginia to extreme western Texas, and in southwestern Arizona and extreme southern California, the mean temperature was above 50°. The mean temperature was lowest in the lower valley of the Red River of the North, in Manitoba, and the eastern part of the British Northwest Territory, where it fell to or below —10°. The mean readings were below zero north of a line traced from northeastern Minnesota southwestward to south-central North Dakota and thence west-northwest to the British Possessions north of western Montana; they were below 10° north of a line traced from Prince Edward Island, Gulf of Saint Lawrence, westward to Lake Superior, thence irregularly southwestward to southern South Dakota, and thence irregularly west-northwestward to northwestern Montana, the mean values also fell below 10° in the more elevated parts of west-central Colorado. North of a line traced from

Massachusetts irregularly westward to central lower Michigan, thence west-southwest to northern New Mexico, thence irregularly west-northwest to north-central California, and east of this line continued northward over Oregon and Washington in about longitude west one hundred and twenty-two the mean temperature was below 30°.

The mean temperature for January, 1890, was above the normal east of a line traced from extreme northwestern Minnesota irregularly southwestward to south-central Arizona; to the westward of this line, and in the Canadian Provinces bordering on the Gulf of Saint Lawrence, the mean temperature was below the normal. The most marked departures above the normal temperature were noted from the Atlantic coast between the thirty-fourth and forty-first parallels westward over the lower lake region and the Ohio Valley, and thence southward over the middle and lower Mississippi valleys, eastern Indian Territory, and eastern Texas, where they exceed 10°; and the greatest departures below the normal temperature occurred in northern Montana and the British Possessions to the northward, where they were more than 10°.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.	°	Below normal.	°
Cleveland, Ohio	13.0	Fort Assiniboine, Mont	12.1
Brownsville, Tex	12.3	Calgary, N. W. T	11.0
Vicksburg, Miss	12.2	Red Bluff, Cal	6.8
Washington City	11.8	Portland, Oregon	6.2
Cairo, Ill	11.6	Sydney, C. B. I	5.0

Along the Atlantic coast from New York to Florida, in the east Gulf states, and at stations in New Mexico and eastern Arizona the current month was the warmest January, while at stations in northern Montana, northern Nevada, and California it was the coldest January in the history of the Signal Service. Over the country east of the Rocky Mountains the warmest previous January shown by Signal Service records was that of 1880. For the current month the mean temperature along the Atlantic and east Gulf coasts and in New Mexico and eastern Arizona exceeded that of January, 1880, by 0°.4 at New York City, 0°.9 at Philadelphia, Pa., 1°.0 at Atlantic City, N. J., 1°.1 at Baltimore, Md., 1°.9 at Washington City, 0°.4 at Lynchburgh, Va., 2°.0 at Norfolk, Va., 0°.6 at Charlotte, N. C., 2°.0 at Wilmington, N. C., 1°.0 at Charleston, S. C., 0°.4 at Southport, N. C., 0°.7 at Savannah, Ga., 0°.9 at Jacksonville, Fla., 2°.5 at Cedar Keys, Fla., 3°.1 at Atlanta, Ga., 2°.7 at Pensacola, Fla., 2°.6 at Mobile, Ala., 0°.6 at Vicksburg, Miss., 2°.1 at New Orleans, La.; 0°.2 above mean of 1877 at Santa Fé, N. Mex.; 1°.6 at Fort Apache, and 1°.6 at Fort Thomas, Ariz., above means of 1887. At Block Island, R. I., the mean temperature was 0°.9 above the highest previous mean for January, noted in 1889. In the middle and northern plateau regions and along the Pacific coast north of the thirty-fifth parallel the coldest previous January shown by Signal Service records occurred in 1888. For the current month the mean temperature in the districts named was lower than that of January, 1888, by 4°.0 at Winnemucca, Nev., 1°.7 at Red Bluff, Cal., 0°.1 at San Francisco, Cal., and 0°.3 at Los Angeles, Cal. In southern California the lowest mean temperature for January was noted in 1882; on the middle-eastern slope of the Rocky Mountains in 1875; in the Mississippi Valley south of the Ohio River in 1886; in the Lake region, New York, New England, and Pennsylvania in 1875 or 1888; elsewhere the years of occurrence of the lowest mean temperature for January were irregular. In December, 1889, the greatest departures above the normal temperature were noted in the middle Mississippi, lower Missouri, and lower Ohio valleys, where they exceeded 15°, and the highest mean temperatures ever reported for December were generally noted east of the Rocky Mountains and south of the Lake region; while for the current month the greatest departures above the normal temperature were reported in the middle Atlantic states south of New York, at Lake Erie stations, and in the Ohio and lower Mississippi valleys, where they exceeded 10°, and the highest mean temperatures ever reported for January were noted along the Atlantic and east Gulf coasts. It will be observed that in December, 1889, the greatest absolute excesses in mean temperature occurred in the central valleys, while for the current month they were noted farther to the eastward. A further comparison of these months shows that the distribution of pressure over the eastern part of the country was similar; that in each month the pressure was abnormally high over the southeastern states; that the pressure in the south Atlantic and east Gulf states was higher and the departures above the normal pressure greater for the current than for the preceding month; and that the area of highest pressure was somewhat more to the eastward in January. In either month no storm-centres traversed the country east of the Mississippi River and south of the Ohio Valley, all of which conditions combined to cause an unusual prevalence of southerly winds east of the Mississippi and south of the Lake region, whereby the warmer air of more southern latitudes was drawn over the districts lying east of the Mississippi River.

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for January for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for January, 1890; (4) the departure of the current month from the normal; (5) and the extreme monthly means for January, during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of Jan.	(2) Length of record.	(3) Mean for Jan., 1890.	(4) Departure from normal.	(5) Extreme monthly mean temperature for Jan.			
						Highest.	Year.	Lowest.	Year.
		°	Years	°	°	°		°	
Arkansas.									
Lead Hill	Boone	31.5	8	45.6	+14.1	45.6	1890	24.2	1886
California.									
Sacramento	Sacramento	46.8	24	38.4	— 8.4	52.7	1873	38.4	1890
Colorado.									
Fort Lyon	Bent	23.5	20	.....	.....	32.3	1880	13.0	1875
Connecticut.									
Middletown	Middlesex	24.5	22	33.7	+ 9.2	33.7	1890	17.3	1888
Florida.									
Merritt's Island	Brevard	61.0	7	69.6	+ 8.6	69.6	1890	55.3	1886
Georgia.									
Forsyth	Monroe	47.7	16	55.9	+ 8.2	59.4	1880	40.8	1884
Illinois.									
Peoria	Peoria	24.2	34	32.8	+ 8.6	40.9	1880	13.5	1857
Riley	McHenry	17.6	34	25.6	+ 8.0	33.2	1880	5.5	1875
Indiana.									
Vevay	Switzerland	30.7	24	43.9	+13.2	47.2	1880	23.0	1884
Iowa.									
Cresco	Howard	8.8	18	14.4	+ 5.6	26.1	1880	— 1.3	1883
Monticello	Jones	15.8	21	21.7	+ 5.9	32.9	1880	6.0	1883
Logan	Harrison	17.9	16	19.2	+ 1.3	34.4	1880	7.1	1886
Kansas.									
Lawrence	Douglas	26.5	27	27.4	+ 0.9	41.2	1880	14.3	1886
Wellington	Sumner	25.6	10	.....	.....	40.4	1880	17.6	1886
Louisiana.									
Grand Coteau	Saint Landry	51.0	7	64.0	+13.0	64.0	1890	47.4	1886
Maine.									
Gardiner	Kennebec	17.9	49	20.5	+ 2.6	26.7	1889	7.1	1844
Maryland.									
Cumberland	Allegany	29.6	31	40.7	+11.1	40.7	1890	19.6	1865, '67
Massachusetts.									
Amherst	Hampshire	23.3	54	31.8	+ 8.5	32.3	1889	13.5	1857
Newburyport	Essex	23.8	13	29.7	+ 5.9	33.1	1880	13.7	1857
Somerset	Bristol	26.3	17	35.4	+ 9.1	35.7	1880	19.4	1888
Michigan.									
Kalamazoo	Kalamazoo	20.9	14	31.2	+10.3	36.0	1880	14.0	1881
Thornville	Lapeer	21.4	13	32.9	+11.5	35.6	1880	15.6	1881
Minnesota.									
Minneapolis	Hennepin	8.3	25	9.6	+ 1.3	23.2	1880	— 4.4	1875
Montana.									
Fort Shaw	Lewis & Clarke	16.2	20	10.8	— 6.4	29.1	1872	— 2.2	1875
New Hampshire.									
Hanover	Grafton	17.3	52	23.0	+ 5.7	26.5	1838	6.8	1857, '88
New Jersey.									
Moorestown	Burlington	29.0	26	40.1	+11.1	40.1	1890	22.2	1867
South Orange	Essex	28.3	19	37.4	+ 9.1	37.6	1880	23.8	1884
New York.									
Cooperstown	Otsego	20.0	36	29.9	+ 9.9	31.6	1880	10.3	1857
Palermo	Oswego	20.5	36	29.4	+ 8.9	29.4	*	11.6	1888
North Carolina.									
Lenoir	Caldwell	35.6	18	46.5	+10.9	46.5	1890	30.2	1882
Ohio.									
N'th Lewisburgh	Champaign	27.3	58	38.0	+10.7	41.0	1880	14.0	1856, '57
Wauseon	Fulton	22.6	20	33.4	+10.8	37.7	1880	12.2	1875

Deviations from normal temperatures—Continued.

State and station.	County.	(1) Normal for the month of Jan.	(2) Length of record.	(3) Mean for Jan., 1890.	(4) Departure from normal.	(5) Extreme monthly mean temperature for Jan.			
						Highest.	Year.	Lowest.	Year.
Oregon.		°	*Years*	°	°	°		°	
Albany	Linn	37.5	12	†34.3	†—3.2	43.8	1887	22.8	1868
Eola	Polk	37.3	19	31.0	— 6.3	42.7	1874	29.7	1875
Pennsylvania.									
Dyberry	Wayne	20.7	25	31.6	+10.9	31.6	1890	13.9	1865
Grampian Hills	Clearfield	22.6	25	34.7	+12.1	35.0	1880	16.1	1867
Wellsborough	Tioga	24.7	10	35.8	+11.1	35.8	1890	19.1	1884
South Carolina.									
Statesburgh	Sumter	44.4	8	†54.6	+10.2	54.6	1890	39.0	1886
Tennessee.									
Austin	Wilson	36.6	21	50.2	+13.6	53.1	1880	28.2	1884
Milan	Gibson	33.3	6	47.9	+14.6	47.9	1890	27.5	1886
Texas.									
New Ulm	Austin	50.1	16	60.0	+ 9.9	63.7	1880	34.8	1875
Vermont.									
Strafford	Orange	15.6	16	22.3	+ 6.7	25.4	1889	6.9	1888
Virginia.									
Birdsnest	Northampt'n	39.3	21	49.6	+10.3	49.6	1890	33.7	1881
Wisconsin.									
Madison	Dane	16.6	27	22.6	+ 6.0	33.6	1880	4.1	1875
Washington.									
Fort Townsend	Jefferson	39.1	18	31.9	— 7.2	55.4	1888	29.6	1869

*1863, 1880, 1890. †Received too late to be used in discussion.

The above table shows that the mean temperature for the current month was the highest mean temperature ever noted for January at stations in Connecticut, New Jersey, Pennsylvania, Maryland, Virginia, North Carolina, Florida, Louisiana, Arkansas, and Tennessee, and that at Sacramento, Cal., the mean temperature was the lowest ever reported for January.

MAXIMUM AND MINIMUM TEMPERATURES.

The highest temperature reported by a regular station of the Signal Service was 88°, at Rio Grande City, Tex., on the 10th. The temperature rose to or above 80° at stations along the Atlantic coast south of the thirty-fifth parallel, in the lower Mississippi valley, from Indian Territory southward over central and south-central Texas, and in southwestern Arizona, and the maximum values were above 70° south of a line traced from the Atlantic coast in about latitude north 40° westward to Colorado, thence southward to south-central New Mexico, and thence westward to southeastern California. The lowest maximum temperature reported was 32°, at Saint Vincent, Minn., and the maximum values fell below 50° north of a line traced from the northern part of lower Michigan southwestward to central Iowa, thence northwestward to central North Dakota, thence southwestward to central Utah, thence westward to west-central Nevada, and east of this line continued northward over eastern Oregon and southeastern Washington, and thence westward to southwestern Washington. The reports of United States Army post surgeons and state weather service and voluntary observers show the following maximum temperatures in states and territories where the temperature was reported 80° or above: Citronelle, Ala., 84°; Fort Lowell, Ariz., 86°; Lead Hill, Ark., 81°; Breckenridge, Colo., 84°; Lake City, Fla., 89°; Camilla, Ga., 83°; Convent, La., 88°; Brookhaven, Kosciusko, and Port Gibson, Miss., 82°; Clarkton N. C., 85°; Conway, S. C., 81°; Fort Ringgold, Tex., 97°. At a number of the older established Signal Service stations in New England, the middle and south Atlantic states, the Florida Peninsula, the east and west Gulf states, the Ohio Valley and Tennessee, the lower and upper lake regions, the upper Mississippi and lower Missouri valleys, and the southern plateau region the maximum temperatures for the current month were the highest ever reported for January. The greatest excesses in the districts named were, respectively, Portland, Me., 4° above maximum of 1876; Philadelphia, Pa., 5° above maximum of 1876; Washington City, 5° above maximum of two or more preceding years; Charlotte, N. C., 4° above maximum of 1888; Cedar Keys, Fla., the same as maximum of 1877; Pensacola, Fla., 5° above maximum of 1882; Palestine, Tex., 1° above maximum of 1888; Memphis, Tenn., 5° above maximum of 1888; Sandusky and Toledo, Ohio, 5° above maximum of 1880 and 1876, respectively; Grand Haven, Mich., 4° above maximum of 1880; Springfield, Ill., 4° above maximum of 1880; Leavenworth, Kans., 2° above maximum of 1876; Fort Apache Ariz., 4° above maximum of two or more preceding years. In the south Atlantic states the highest previous maximum temperature for January was generally noted in 1879; in the lower Rio Grande valley in 1887; in the lower lake region in 1874; in the upper Mississippi valley in 1874 or 1880; elsewhere the periods of occurrence were irregular.

The lowest temperature reported by a regular station of the Signal Service was —39° at Fort Assinniboine, Mont., on the 5th. The temperature fell below —30° in the Valley of the Red River of the North and thence westward over North Dakota and the eastern half of Montana. The minimum values were below —20° in Minnesota (except along the shore of Lake Superior) and north of a line traced from eastern Wisconsin south of Green Bay westward to southeastern Idaho, and thence northwestward over the eastern part of Washington; they were also below —20° over northwestern Nevada. The minimum temperature fell below zero north of a line traced from the coast of northern Massachusetts, north of west to northern lower Michigan, thence southward over Lake Michigan to central Illinois, thence south of west to northern New Mexico and central Arizona, and east of this line continued northwestward to eastern California in about latitude north 38°, and thence northward over central Oregon and Washington. The highest minimum temperature reported was 65° at Key West, Fla., and the minimum values were above 40° over the Florida Peninsula and extreme southern Louisiana. The reports of United States Army post surgeons and state weather service and voluntary observers show the following minimum temperatures in states and territories where the temperature fell to or below zero: Martindale, Mont., —42°; Gallatin, N. Dak., —40°; Gunnison, Colo., —39°; Pokegama Falls, Minn., —38°; Niellsville, Wis., —36°; Fort Niobrara, Nebr., —34°; Soda Springs, Idaho, and Millbank, S. Dak., —31°; Fort Bridger, Wyo., —30°; Fayette, Iowa, —27°; Jordan Valley, Oregon, —24°; Orono, Me., and Fort DuChesne and Nephi, Utah, —23; Fort Spokane, Wash., —22°; Fremont, Kans., and West Milan, N. H., —21°; Fort Bidwell, Cal., and Crystal Falls, Mich., —20°; Conception, Mo., —19°; East Berkshire, Vt., —18°; Plattsburgh Barracks, N. Y., —15; Woodstock, Ill., —13°; Fort Marcy, N. Mex., —4°; La Fayette, Ind., and Lake Cochituat, Mass., —3°; and Blue Knob, Pa., —2°. Among extremely low temperatures reported for January of preceding years are: Poplar River, Mont., —63°, in 1885 (this is the lowest temperature ever reported for any month in the United States); Saint Vincent, Minn., —53°, in 1888; La Crosse, Wis., —43°, in 1873; Duluth, Minn., —41°, in 1885; Fort Sally, S. Dak., —39°, in 1883; Fort Klamath, Oregon, —39°, in 1888; Cheyenne, Wyo., —38°, in 1875; Eagle Rock, Idaho, —38°, in 1883; Dubuque, Iowa, —31°, in 1887; Winnemucca, Nev., —28°, in 1888; Indianapolis, Ind., —25°, in 1884; Burlington, Vt., —25°, in 1882; Oswego, N. Y., —23°, in 1885; Eastport, Me., —20°, in 1874; Albany, N. Y., —18°, in 1878; Whipple Barracks (Prescott), Ariz., —17°, in 1880; Washington City, —14°, in 1881; Fort Elliott, Tex., —14°, in 1888; Charlotte, N. C., —1°, Atlanta, Ga., —2°, and Little Rock, Ark., —5°, in 1886; Jacksonville, Fla., 15°, in 1886; Brownsville, Tex., 18°, in 1881; Red Bluff, Cal., 18°, in 1888; and Los Angeles, Cal., 30°, in two or more years. The lowest absolute minimum temperature for January of preceding years was generally noted in the south Atlantic, east and west Gulf states, and the Florida Peninsula, in 1886; in the Ohio and upper Mississippi valleys and Tennessee, in 1884; in the middle and northern plateau regions and on the Pacific coast, in 1888; elsewhere the periods of occurrence were irregular.

LIMITS OF FREEZING WEATHER.

The southern limit of freezing weather for January, 1890, is shown on chart iv by a line traced from Hatteras, N. C.,

southwestward off the coast to east-central South Carolina, thence to Savannah, Ga., thence over extreme southern Alabama, Mississippi, Louisiana, and eastern Texas to Corpus Christi, Tex., and thence to the Rio Grande Valley above Rio Grande City, Tex. The western limit of freezing weather is shown by a line traced from the California coast in about latitude north 38° southwestward, inside of the coast line, to extreme south-central California. Compared with the limits of freezing weather for December, 1889, the line showing the southern limit for the current month was about two degrees farther south on the immediate Atlantic coast; about the same from the Atlantic coast to Louisiana; and two to three degrees farther south in Louisiana and eastern Texas. On the Pacific coast the line of freezing weather was about four degrees farther south on the California coast and about three degrees farther west along the southern border of the country.

RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature at regular stations of the Signal Service are given in the table of miscellaneous meteorological data. The greatest monthly ranges of temperature occurred from eastern and central Montana southeastward over the western part of the Dakotas, and at Denver, Colo., where they equalled or exceeded 80°, whence they decreased eastward to the eastern part of the upper lake region, where they were less than 50°, and thence increased eastward to northern New England, where they were more than 70°. From the upper Missouri valley the monthly ranges decreased southeastward to less than 20° in southern Florida, southward to less than 40° on the west Gulf coast, southwestward to less than 60° in southern Arizona, and to less than 40° in southern California, and westward to less than 30° along the middle and north Pacific coasts. In northwestern Nevada the monthly ranges exceeded 70°.

The following are some of the extreme monthly ranges:

Greatest.	°	Least.	°
Fort Maginnis, Mont.	87.0	Key West, Fla.	15.0
Valentine, Nebr.	83.0	San Francisco, Cal.	23.0
Denver, Colo.	80.0	Fort Canby, Wash.	27.0
Carson City, Nev.	72.0	San Diego, Cal.	31.0
Northfield, Vt.	71.0	Galveston, Tex.	39.0

FROST.

An unusually heavy frost was reported at Keeler, Cal., on the 6th; on the 17th potato vines, strawberry blossoms, and sprouts on fig trees were reported killed at Hammond, La.; and on the 16th and 17th cane sprouts were reported nipped by frost at Grand Coteau, La. No frost was reported in Florida, save in the extreme north-central part on the 17th. Frost was reported along the Gulf coast from Mobile, Ala., to Corpus Christi, Tex.; along the southern border of the country from Texas to the Pacific coast, and generally over California. Compared with December, 1889, the southern limit of frost along the Atlantic coast for the current month was about 3° farther north; along the middle Gulf coast the southern limit was about the same; on the west Gulf coast frost occurred 2° to 3° farther south in December; from Texas westward frost was reported to the extreme southern boundary of the country and along the California coast for each month. In the south Atlantic and Gulf states frost was reported most frequently in Mississippi, where it was noted for thirteen dates; in Texas for eleven dates; in Georgia and Louisiana for eleven dates; in Alabama for nine dates; in South Carolina for eight dates; and in Florida for one date. On the Pacific coast frost was reported in California for twenty-five dates; in Oregon for twenty-two dates; and in Washington for two dates. Frost was reported in seven of the south Atlantic and Gulf states on the 17th; in six on the 14th; in five on the 16th and 22d; in four on the 13th, 21st, and 23d to 25th; in three on the 18th; in two on the 9th and 31st; and in one on the 1st, 8th, 10th to 12th, 19th, 20th, and 28th to 30th. On the 2d to 7th, 26th, and 27th no frost was reported in the south Atlantic or Gulf states. In California frost was reported on the 1st, 2d, 4th to 16th, 19th to 23d, 26th to 29th, and 31st; in Oregon on the 1st to 14th, and 16th to 23d; and in Washington on the 4th and 11th.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for January, 1890:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
	°	°	°	°	°
Boston, Mass.	41.8	33.5	8.3	39.1	32.4
Canby, Fort, Wash.	46.0	39.5	6.5	41.9	36.0
Cedar Keys, Fla.	75.0	62.9	12.1	70.7	66.0
Charleston, S. C.	61.8	55.8	6.0	59.3	59.3
Eastport, Me.	41.0	36.5	4.5	39.5	20.6
Galveston, Tex. *j*	70.8	51.1	19.7	64.9	64.0
Key West, Fla.	75.5	71.9	3.6	74.0	73.4
Nantucket, Mass.	43.0	37.0	6.0	39.8	34.6
New York City.	43.0	36.4	6.6	40.0	40.2
Portland, Oregon	40.1	32.5	7.6	36.4	31.8

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for January, 1890, as determined from the reports of nearly 1,800 stations, is exhibited on chart iii. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

The greatest monthly precipitation reported for January, 1890, was 33.40, at Upper Mattole, Humboldt Co., Cal., and the precipitation amounted to 20.00 in eastern California between the thirty-eighth and fortieth parallels and on the west-central coast of California. Within an area extending from southwestern Washington over western Oregon and northwestern California, and in areas in east-central Arkansas, south-central Indiana, south-central Illinois, southeastern Missouri, west-central Tennessee, and east-central Texas, the monthly precipitation exceeded 10.00. In areas in southwestern Arizona, south-central Colorado, north-central New Mexico, northeastern South Dakota, and at stations near the southern coast of Great Salt Lake, Utah, no precipitation was reported; and less than 0.50 fell in areas in southeastern California, central Florida, south-central Georgia, west-central Idaho, western Kansas, southeastern Louisiana, western Maryland, northern Minnesota, northeastern and eastern Montana, western Nebraska, northern, eastern, and western North Dakota, western Texas, southern and eastern West Virginia, and eastern Wyoming. In the Atlantic coast states the heaviest monthly precipitation occurred in central New York, where it exceeded 7.00; in the central valleys, in east-central Illinois, where it exceeded 14.00; on the eastern slope of the Rocky Mountains, in northwestern Wyoming, where it exceeded 6.00; in the plateau region, in east-central Nevada, where it exceeded 9.00; and on the Pacific coast, on the California coast north of the fortieth parallel, where it exceeded 30.00, and in eastern California between the thirty-eighth and fortieth parallels, and on the west-central California coast, where it exceeded 20.00.

The precipitation for January, 1890, was below the normal in the Atlantic and east Gulf states, and from the upper lake region westward to eastern Oregon and Washington; it was also below the normal from the upper Missouri valley, southward over eastern Colorado and central New Mexico. Elsewhere the precipitation was generally in excess of the average amount for January. The greatest deficiencies were noted on the North Carolina coast, where they exceeded 5.00, and on the middle coast of the Gulf of Mexico, where they exceeded 4.00. The greatest excesses in precipitation were reported in the middle Mississippi and middle and lower Ohio valleys, where they were more than 5.00, and where in central Indiana they exceeded 7.00, and on the Pacific coast south of the Columbia River, where they were more than 4.00, and where at Los Angeles, Cal., they exceeded 5.00. The very unequal distribution of precipitation for the month is shown by the fact that at stations in New York, Arkansas, Tennessee, Indiana, Ohio, Michigan, Minnesota, Illinois, Missouri, Indian Territory, Colorado, Utah, Washington, and southern California, the monthly precipitation was the greatest, while at stations in Pennsylvania, Virginia, North Carolina, Georgia, Florida, Alabama, Louisiana, and North Dakota it was the least ever reported for January. The greatest precipitation previously noted for January was generally reported in Florida in 1889; on the middle Pacific coast in 1878; and on the south Pacific coast in 1886. The least precipitation previously reported for January was generally noted in Florida in 1888; in the east Gulf states in 1880; on the southeastern slope of the Rocky Mountains, in the southern plateau region, and on the south Pacific coast in 1887; and on the north and middle Pacific coasts in 1889. Elsewhere the periods of occurrence were irregular.

For January, 1890, the average percentages of the precipitation in districts where the precipitation was in excess of the average for the month were about as follows: west Gulf states, 141 per cent.; Ohio Valley and Tennessee, 150 per cent.; lower lake region, 148 per cent.; upper lake region, 143 per cent.; extreme northwest, 109 per cent.; upper Mississippi valley, 187 per cent.; Missouri Valley, 122 per cent.; middle-eastern slope of the Rocky Mountains, 243 per cent.; southeastern slope of the Rocky Mountains, 136 per cent.; southern plateau region, 170 per cent.; middle plateau region, 228 per cent.; north Pacific coast, 120 per cent.; middle Pacific coast, 165 per cent.; south Pacific coast, 226 per cent. In districts where the precipitation was below the average for the month the percentages of the normal were about as follows: New England, 66 per cent.; middle Atlantic states, 46 per cent.; south Atlantic states, 22 per cent.; Florida Peninsula, 18 per cent.; east Gulf states, 38 per cent.; Rio Grande Valley, 75 per cent.; northeastern slope of the Rocky Mountains, 43 per cent.; northern plateau region, 85 per cent. The statement of percentages of precipitation by districts shows that the greatest excess above the normal amount for January occurred on the middle-eastern slope of the Rocky Mountains, where the unusually heavy rainfalls at stations in Indian Territory made the precipitation for the current month nearly two and one-half times greater than the January average for that district, and on the south Pacific coast, where the rainfall was more than double the usual amount for January. The greatest deficiencies are shown in the Florida Peninsula, where but 18 per cent. of the normal fell, and the precipitation was less than one-half the usual amount for January in the middle and south Atlantic states, the east Gulf states, and on the northeastern slope of the Rocky Mountains.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for January for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for January, 1890; (4) the departure of the current month from the average; (5) and the extreme monthly precipitation for January during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of Jan.	(2) Length of record.	(3) Total for Jan., 1890.	(4) Departure from average.	(5) Extreme monthly precipitation for January.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		*Inches*	*Years*	*Inches*	*Inches.*	*Inches*		*Inches.*	
Lead Hill	Boone	2.58	8	7.37	+4.79	7.37	1889	1.33	1887
California.									
Sacramento	Sacramento	3.77	36	7.44	+3.67	15.04	1862	0.19	1889
Colorado.									
Fort Lyon	Bent	0.18	15	.....	.....	0.68	1886	T.	1876
Connecticut.									
Middletown	Middlesex	4.29	28	2.84	−1.45	7.18	1859	1.45	1876
Florida.									
Merritt's Island	Brevard	4.02	12	0.56	−3.46	10.45	1878	0.56	1890
Georgia.									
Forsyth	Monroe	5.25	16	2.87	−2.38	10.08	1883	2.22	1880
Illinois.									
Peoria	Peoria	1.70	32	2.80	+1.10	4.27	1862	0.20	1872
Riley	McHenry	1.95	39	2.65	+0.70	5.96	1876	0.45	*
Indiana.									
Logansport	Cass	1.95	15	5.69	+3.74	5.69	1890	0.23	1881
Vevay	Switzerland	3.99	23	7.37	+3.38	9.03	1876	0.75	1872
Iowa.									
Cresco	Howard	1.32	18	1.90	+0.58	3.72	1886	0.38	'72-'84
Monticello	Jones	1.65	35	1.90	+0.25	3.77	1886	0.29	1865
Logan	Harrison	1.28	21	1.09	−0.19	3.10	1881	0.10	1872
Kansas.									
Lawrence	Douglas	1.23	25	2.50	+1.27	3.05	1878	0.12	1875
Wellington	Sumner	0.73	11	.....	.....	1.53	1886	0.18	1881
Louisiana.									
Grand Coteau	St. Landry	6.92	7	2.55	−4.37	13.30	1883	2.52	1887
Maine.									
Gardiner	Kennebec	3.75	48	3.18	−0.57	7.32	1887	0.92	1849
Maryland.									
Cumberland	Allegany	2.16	18	1.46	−0.70	3.90	1878	0.30	1887
Massachusetts.									
Amherst	Hampshire	3.34	54	3.34	0.00	5.87	1870	0.99	1849
Newburyport	Essex	3.69	11	2.85	−0.84	7.76	1886	1.60	1875
Somerset	Bristol	4.44	17	2.24	−2.20	7.60	1878	1.57	1879
Michigan.									
Kalamazoo	Kalamazoo	2.48	14	3.45	−0.97	4.90	1876	1.10	1879
Thornville	Lapeer	1.97	13	3.38	+1.41	3.38	1890	0.58	1879
Minnesota.									
Minneapolis	Hennepin	1.21	24	1.04	−0.17	3.01	1886	0.06	1869
Montana.									
Fort Shaw	LewisaClarke	0.62	19	0.30	−0.32	2.50	1881	0.00	1869
New Hampshire.									
Hanover	Grafton	2.91	45	2.48	−0.43	9.75	1851	0.31	1853
New Jersey.									
Moorestown	Burlington	3.51	26	1.79	−1.72	5.82	1882	1.13	1867
South Orange	Essex	4.13	18	2.91	−1.22	7.15	1889	1.17	1876
New York.									
Cooperstown	Otsego	2.43	36	4.39	+1.96	4.39	1890	0.32	1860
Palermo	Oswego	3.15	36	4.11	+0.96	6.50	1874	0.16	1884
North Carolina.									
Lenoir	Caldwell	4.45	18	1.10	−1.35	9.60	1878	1.10	1890
Ohio.									
N. Lewisburgh	Champaign	3.70	18	5.20	+1.50	8.67	1876	0.44	1877
Wauseon	Fulton	2.22	16	4.14	+1.92	4.14	1890	1.29	1879
Oregon.									
Albany	Linn	8.66	13	†10.65	+1.99	14.45	1867	2.22	1882
Eola	Polk	6.04	20	7.63	+1.59	16.68	1888	2.53	1875
Pennsylvania.									
Dyberry	Wayne	3.22	20	2.74	−0.48	4.75	1878	0.70	1872
Grampian Hills	Clearfield	3.73	19	4.41	+0.68	5.47	1888	1.21	1872
Wellsborough	Tioga	6.88	10	1.98	−4.90	12.17	1886	1.98	1890
South Carolina.									
Statesburgh	Sumter	3.87	8	†0.90	−2.97	6.04	1885	0.90	1890
Tennessee.									
Austin	Wilson	5.40	21	8.65	+3.25	18.11	1882	2.66	1886
Milan	Gibson	5.63	6	9.11	+3.48	9.11	1890	4.45	1884
Texas.									
New Ulm	Austin	4.31	16	4.21	−0.10	10.56	1882	1.00	1887
Vermont.									
Strafford	Orange	3.49	16	3.70	+0.21	5.59	1887	1.70	1878
Virginia.									
Birdsnest	Northampton	3.78	21	1.02	−2.76	6.75	1882	1.00	1876
Wisconsin.									
Madison	Dane	1.94	24	1.81	−0.13	3.65	1874	0.40	1878
Washington.									
Fort Townsend	Jefferson	2.06	19	4.65	+2.59	4.65	1890	0.66	1859

*1865, 1867, 1872. †Received too late for discussion.

The above table shows that at Logansport, Ind., fifteen years record, Thornville, Mich., thirteen years record, Cooperstown, N. Y., thirty-six years record, Wauseon, Ohio, sixteen years record, Milan, Tenn., six years record, and Fort Townsend, Wash., nineteen years record, the precipitation for the current month was the greatest, while at Merritt's Island, Fla., twelve years record, Lenoir, N. C., eighteen years record, and Wellsborough, Pa., ten years record, it was the least reported for January.

EXCESSIVE PRECIPITATION.

The table of excessive precipitation shows that precipitation

to exceed 30.00 fell at one station in California; to exceed 20.00 at two stations in California; to exceed 10.00 at thirteen stations in California; five stations in Illinois; three stations in Indiana and Oregon, respectively; two stations in Washington; and at one station in Arkansas, Missouri, Tennessee, and Texas. The greatest monthly precipitation, 33.40, was reported at Upper Mattole, Humboldt Co., Cal.

In January of preceding years precipitation to equal or exceed ten inches has been reported most frequently in Oregon, where it was noted for twenty-seven years; in California for twenty-three years; in Washington for twenty years; in Alabama for thirteen years; in Florida, Georgia, Louisiana, Mississippi, New York, North Carolina, Tennessee, and Virginia, for from five to ten years, inclusive; and in Arizona, Arkansas, Connecticut, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Nevada, New Hampshire, New Jersey, Ohio, Pennsylvania, and Texas, for from one to four years, inclusive. In states and territories other than those named, precipitation to equal or exceed ten inches has not been reported for January of preceding years. Among the heavier rainfalls reported for January of preceding years are: 24.36 at San Francisco, Cal., in 1862; 26.50 at Fort Gaston, Cal., in 1866; 22.30 at Fort Gaston, Cal., in 1867; 26.23 at Camp Lincoln, Cal., in 1867; 22.69 at Redding, Cal. in 1878; 25.69 at Emigrant Gap, Cal., in 1881; 41.63 at Upper Mattole, Cal., in 1888; 27.00 at Astoria, Oregon, in 1851; 21.52 at Astoria, Oregon, in 1855; 22.16 at Astoria, Oregon, in 1871; 24.50 at Neah Bay, Wash., in 1864; 21.70 at Neah Bay, Wash., in 1866; 20.50 at Tatoosh Lighthouse, Wash., in 1871; 30.50 at Neah Bay, Wash., in 1874; 22.30 at Neah Bay, Wash., in 1887. Exclusive of the instances and years cited, precipitation to equal or exceed fifteen inches has been reported for twelve years in California; for eight years in Oregon; for seven years in Washington; for two years in Georgia, Louisiana, and Massachusetts; and for one year in Arizona, Illinois, and Indiana.

Precipitation to equal or exceed 2.50 in twenty-four hours was reported at seventeen stations in California, at fourteen stations in Tennessee, at thirteen stations in Indiana, at eight stations in Missouri, at four stations in Louisiana, at seven stations in Illinois and Texas, at five stations in Arkansas, at three stations in Mississippi, at two stations in Kentucky and Oregon, and at one station each in Indian Territory, North Carolina, and Ohio. Among the heavier rainfalls reported for this period were: 6.45, at Huntsville, Tex., on the 2d; 5.96, at Upper Mattole, Cal., on the 29th; 5.20, at Fullerton, Ark, on the 1st; 4.41, at Indianapolis, Ind., on the 1st; 4.36, at Atwood, Ill., on the 12th; 4.26, at Los Gatos, Cal., on the 25th; 3.97, at Ironton, Mo., on the 1st; 3.00, at Austin and Watkins, Tenn., on the 15th.

In January of preceding years precipitation to equal, or exceed, 2.50 inches in twenty-four hours has been reported most frequently in Georgia, Louisiana, and Tennessee, where it has been noted for eleven years; in Alabama, California, Florida, Massachusetts, Mississippi, New York, North Carolina, Ohio, Oregon, Pennsylvania, Texas, Virginia, and Washington, for from five to ten years, inclusive; and in Arizona, Arkansas, Connecticut, Delaware, Illinois, Indiana, Indian Territory, Iowa, Kentucky, Maine, Maryland, Michigan, Missouri, New Hampshire, New Jersey, South Carolina, and Wisconsin, for from one to four years, inclusive. In states and territories other than those named, precipitation to equal, or exceed, 2.50 inches in twenty-four hours has not been reported for January of preceding years. Among the heavier January rainfalls for this period in preceding years are: 6.38, at Jupiter, Fla., 11–12th, 1889; 6.03, at Hephzibah, Ga., 19–20th, 1889; 5.71, at Shreveport, La., 13th, 1885; 5.35, at Monroe, La., 2d, 1886; 8.40, at Point Pleasant, La., 1st–2d, 1886; 7.00, at Emory Grove, Md., 30th, 1879; 6.00, at Fayette, Minn., 6th, 1883; 6.32, at Lynchburgh, Va., 23d, 1885. At Upper Mattole, Cal., 31.68 fell from January 27 to 31, 1888.

The only report of precipitation to equal, or exceed, 1.00 inch in one hour was 4.36, in one hour, at Atwood, Ill., 1st.

In January of preceding years precipitation to equal, or exceed, one inch in one hour has been reported for two years in Illinois, and for one year each in Florida, Georgia, Texas, and California. In states and territories other than those named precipitation to equal, or exceed, one inch in one hour has not been reported for January of preceding years. Among the heavier rainfalls noted for this period in January of preceding years are: 1.60, in one hour, at Cairo, Ill., 17th, 1876; 1.03, in twenty-eight minutes, at Titusville, Fla., 4th, 1889.

Table of excessive precipitation, January, 1890.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Arkansas.	*Inches.*	*Inches.*		*Inches*	*h. m.*	
Forrest City	.....	2.50	2	.....	.....	.....
Fulton	.....	5.20	1	.....	.....	.....
Helena (1)	10.13	3.16	2	.....	.....	.....
Do	.....	2.90	15	.....	.....	.....
Little Rock	.....	2.73	1–2	.....	.....	.....
Newport	.....	3.11	2	.....	.....	.....
California.						
Alcatraz Island	10.66	.....	.....	.....	.....	.....
Anderson	10.56	2.51	24	.....	.....	.....
Berkeley	11.16	3.63	25	.....	.....	.....
Colegrove	.....	3.72	25	.....	.....	.....
Eureka	18.26	3.72	11–12	.....	.....	.....
Ferndale	22.17	2.96	24	.....	.....	.....
Fort Gaston	18.29	.....	.....	.....	.....	.....
Georgetown	19.90	2.60	25	.....	.....	.....
Grass Valley	18.01	2.88	25	.....	.....	.....
Hydesville	17.31	.....	.....	.....	.....	.....
Iowa Hill	20.87	2.82	17	.....	.....	.....
Do	.....	3.20	25	.....	.....	.....
Jolon	.....	4.10	24–25	.....	.....	.....
Julian	.....	2.56	25–26	.....	.....	.....
Los Angeles	.....	4.17	25–26	.....	.....	.....
Los Gatos (2)	16.45	3.20	24	.....	.....	.....
Do	.....	4.26	25	.....	.....	.....
Mendocino	12.41	.....	.....	.....	.....	.....
Oakland (1)	10.22	.....	.....	.....	.....	.....
Pasadena	.....	2.70	25–26	.....	.....	.....
Presidio of San Francisco	11.06	.....	.....	.....	.....	.....
Upper Mattole	33.40	2.96	13	.....	.....	.....
Do	.....	3.98	16	.....	.....	.....
Do	.....	5.96	29	.....	.....	.....
Vacaville (1)	12.37	2.54	24	.....	.....	.....
Illinois.						
Atwood	14.62	4.36	12	4.36	1 00	12
Centralia	10.38	.....	.....	.....	.....	.....
Flora	10.06	.....	.....	.....	.....	.....
Greenville	.....	3.03	*	.....	.....	.....
Jordan's Grove	.....	2.62	1	.....	.....	.....
Louisville	.....	3.00	*	.....	.....	.....
Mascoutah	10.00	3.10	*	.....	.....	.....
Pana	11.65	5.25	*	.....	.....	.....
Do	.....	2.75	6–7	.....	.....	.....
White Hall	.....	2.99	12	.....	.....	.....
Indiana.						
Connersville	.....	2.50	6–7	.....	.....	.....
Farmland	.....	3.00	1	.....	.....	.....
Franklin	.....	2.80	1	.....	.....	.....
Huntingburgh	11.90	2.50	6	.....	.....	.....
Indianapolis	10.20	4.41	1	.....	.....	.....
Marengo	.....	4.20	6–7	.....	.....	.....
Marion	.....	3.20	1	.....	.....	.....
New Providence	.....	2.60	6	.....	.....	.....
Point Isabel	.....	3.10	1	.....	.....	.....
Richmond	.....	2.71	5–6	.....	.....	.....
Shelbyville	.....	2.55	1	.....	.....	.....
Spiceland	.....	3.80	1–2	.....	.....	.....
Vevay	.....	2.92	6	.....	.....	.....
Worthington	10.69	4.00	1–2	.....	.....	.....
Indian Territory.						
Fort Gibson	.....	2.80	22	.....	.....	.....
Kentucky.						
Frankfort (1)	.....	2.53	15	.....	.....	.....
South Fork	.....	2.90	19–20	.....	.....	.....
Louisiana.						
Alexandria	.....	3.72	15	.....	.....	.....
Coushatta	.....	2.50	4	.....	.....	.....
Grand Cane	.....	2.50	4	.....	.....	.....
Shreveport	.....	2.62	1–2	.....	.....	.....
Mississippi.						
Holly Springs	.....	2.50	14	.....	.....	.....
Okalona	.....	3.70	15	.....	.....	.....
Vicksburg	.....	2.53	15	.....	.....	.....
Missouri.						
Carthage	.....	2.65	11–12	.....	.....	.....
Ironton	10.50	3.75	1	.....	.....	.....
Jerome	.....	3.97	1	.....	.....	.....
New Haven	.....	5.00	4–6	.....	.....	.....
Oak Ridge	.....	2.50	1	.....	.....	.....
Saint Charles (1)	.....	2.50	1	.....	.....	.....
Saint Louis	.....	3.57	1	.....	.....	.....
Willow Springs	.....	2.90	1	.....	.....	.....
North Carolina.						
Washington	.....	2.60	29–30	.....	.....	.....
Ohio.						
Georgetown	.....	2.71	14–15	.....	.....	.....

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Oregon.	*Inches.*	*Inches.*		*Inches*	*h. m.*	
Astoria	12.64					
McMinnville	14.21	2.50	29			
Do		3.36	31			
Portland	11.13					
Tennessee.						
Arlington		2.50	1			
Ashwood		2.70	20			
Austin		3.00	15			
Do		2.55	31			
Bolivar	10.70	2.90	1			
Grand Junction		2.68	14–15			
Kingston		3.57	20–21			
Memphis		2.78	2			
Milan (1)		2.50	1			
Nashville		2.78	14–15			
Nunnelly		2.53	15			
Rockwood		2.80	21			
Savannah		2.55	15			
Watkins		3.00	15			
Woodstock		2.50	2			
Texas.						
Brazoria		3.18	2–3			
College Station		4.37	2			
Columbia		3.40	3			
Do		3.00	15			
Huntsville	10.46	6.45	2			
Houston		3.44	3			
LaGrange		4.30	1			
New Ulm		2.63	2			
Washington.						
Fort Canby	12.07					
Vancouver Barracks	12.55					

*December 31, 1889, and January 1, 1890.

MAXIMUM RAINFALLS IN ONE HOUR OR LESS.

The following table is a record of the heaviest rainfalls during January, 1890, for periods of five and ten minutes and one hour, as reported by regular stations of the Signal Service furnished with self-registering gauges:

Station.	Maximum fall in—					
	5 min.	Date.	10 min.	Date.	1 hour.	Date.
	Inch.		*Inch.*		*Inch.*	
Bismarck, N. Dak*						
Boston, Mass	0.03	27	0.05	27	0.17	27
Buffalo, N. Y	0.04	6	0.08	6	0.15	19
Cincinnati, Ohio	0.05	15	0.10	15	0.25	15
Chicago, Ill*						
Detroit, Mich	0.03	19	0.05	19	0.15	19
Galveston, Tex	0.25	15	0.40	4	0.75	4
Jupiter, Fla*	0.15	30	0.28	30	0.80	30
Marquette, Mich*						
New York City	0.03	15	0.05	15	0.25	15
New Orleans, La	0.05	29	0.07	29	0.10	29
Norfolk, Va	0.05	16	0.08	30	0.24	30
Savannah, Ga †			0.05	3	0.05	3, 15
San Francisco, Cal	0.16	24–25	0.32	24–25	0.55	24–25
Saint Louis, Mo*						
Washington City	0.01	30	0.02	30	0.10	30

* No record on account of snow and other causes. † Incomplete.

SNOW (snowfall in inches and tenths.)

The greatest depth of snowfall reported for the month was two hundred and twenty-nine inches at Cisco, Cal.; at Towle's, Cal., one hundred and ninety-four inches were reported, and at Emigrant Gap, Cal., a total depth of one hundred and sixty-nine inches was measured. At Ruby Hill, east-central Nevada, the monthly snowfall was one hundred and eleven inches. Exclusive of the depths above noted the maximum depth of snowfall in the several states and territories where ten inches, or more, of snow fell was as follows: 73 at Era, east-central Idaho; 69 at Veronia, extreme northwestern Oregon; 59 at Atlantic, extreme northern upper Michigan; 52 at Camp Sheridan, extreme northwestern Wyoming; 39 at Fort Spokane, extreme east-central Washington; 38 at Corinne, northwestern Utah; 36 at Number Four, north-central New York; 28 at Green Bay and Embarrass, extreme east-central Wisconsin; 24 at Eastport, Me., East Berkshire, extreme north-central Vermont, and Wiers Bridge and West Milan, eastern New Hampshire; 21 at Virginia City, southwestern Montana, and at Spearfish, southwestern South Dakota; 19 at Aspen, west-central Colorado; 17 at Des Moines, Iowa; 16 at Wakefield, north-central Kansas, at Saint Vincent Minn., at Oregon, northwestern Missouri, and at Blue Knob, south-central Pennsylvania; 14 at Fort Wingate, west-central New Mexico; 13 at Lowell and Lynn, northeastern Massachusetts, and David City, east-central Nebraska. On the Atlantic coast measurable snow, trace, fell as far south as south-central North Carolina; in the central valleys as far south as northern Tennessee and northern Arkansas; in the Rocky Mountain and plateau regions north of a line traced from central Indian Territory south of west to extreme southeastern Arizona; on the Pacific coast a depth of five inches was reported at Julian, San Diego Co., Cal., of which four inches fell on the 5th, and one inch on the 18th. During the latter half of the month about one hundred and twenty miles of the Central Pacific Railroad crossing the summit of the Sierra Nevada Mountains was blocked by snow.

Snowfalls of ten inches or more were reported, as follows, and in states and territories where the maximum depth was below that amount, the station reporting the greatest is given: *Arizona.*—Fort Apache and Whipple Barracks, 5.5. *Arkansas.*—Winslow, trace. *California.*—Cisco, 229; Towle's, 194; Summit, 192; Emigrant Gap, 169; Truckee, 162; Boca, 146; Sims, 109.5; Susanville, 76.5; Fort Bidwell, 69.7; Colfax, 55; Placerville, 19; El Dorado and Girard, 15.5; Shingle Springs, 13.5; Redding, 12.5. *Colorado.*—Aspen, 19; Emma, 18; Fraser, 14; Breckenridge, 10.5; Climax, 10.3. *Connecticut.*—Waterbury, 5. *Idaho.*—Era, 73; Fort Sherman, 35; Boisé City, 12.4. *Illinois.*—Atwood, 8. *Indiana.*—Dana, 7.1. *Indian Territory.*—Fort Reno, 1.5. *Iowa.*—Des Moines *a*, 17.4; Des Moines *b*, 16; Clarinda, 15; Fayette, 13.5; Blakeville, Carroll, and Vinton, 12; Independence, 11.8; Sioux City, 11.5; Hampton, 11; Cresco, Sac City, and Storm Lake, 10. *Kansas.*—Wakefield, 15.5; Fremont, 12.5; Wichita, 10.6; Concordia, Fort Leavenworth, and Manhattan, 10.5; Salina, 10.2. *Kentucky.*—Newport Barracks, 2.5. *Maine.*—Eastport, 24.3; Cornish and Orono, 10. *Maryland.*—Cumberland, 1.5. *Massachusetts.*—Lowell and Lynn, 13; Fitchburg *a* and Newport *a*, 12; Fitchburg *b* and Groton, 11; Clinton, Leominster, Salem, and Wakefield, 10. *Michigan.*—Atlantic, 59; Calumet, 49.3; Lathrop, 42; Saint Ignace, 38; Sault de Ste. Marie, 35.3; Marquette, 32; Fort Brady, 31.4; Alpena, 27.9; Bear Lake, 25.5; Grayling and Traverse City, 20; Fort Mackinac, 18; Evan and Roscommon, 16; Benzonia and Crystal Falls, 15.5; Weldon Creek, 15; Charlevoix, 14.8; Otsego, 13.5; Buchanan and Manchester, 12; Hart 10. *Minnesota.*—Saint Vincent, 16.4; Sheldon, 11.8; Minneapolis, 10.4. *Missouri.*—Oregon, 16.1. *Montana.*—Virginia City, 21.2; Fort Logan, 13. *Nebraska.*—David City, 13.2; Palmer and Weeping Water, 12; West Point, 11.8; Howe, 11.5; Genoa, 11.2; Omaha, 10.9; Crete, 10.2; Ravena, 10.1; Tecumseh and West Hill, 10. *Nevada.*—Ruby Hill, 111; Virginia City, 72.4; Elko, 69; Verdi, 67; Lewers' Ranch, 62.3; Tuscarora, 59; Carson City *a*, 56.9; Carson City *b*, 55.1; Reno *a*, 54.2; Austin, 47.5; Genoa, 42.3; Burner's Ranch, 36; Beowawe, 35; Reno *b*, 34; Winnemucca, 33; Fenelon, 33.5; Humboldt, 31.5; Downeyville, 30.9; Eureka, 30; Sodaville, 29; Ely, 27; Mill City, 25; Battle Mountain, 24; Toano, 23.5; Palisade, 23.2; Carlin; 22.5; Wells, 21; Hot Springs, 20.5; Golconda, 18.5; Tecoma, 17; Brown's, 13.5; Hawthorn, 11.5; Clair, 10.3; Belmont, 10.1; Ferguson's Ranch and Tehachapi, 10. *New Hampshire.*—Wiers Bridge and West Milan, 24; Lake Village, 22; Wolfborough, 21; Belmont, Hanover *a*, and Plymouth, 18; Hanover *b*, 16.5; Manchester *a*, 16.2; Bristol, 16; Strafford, 15; North Sutton, 13.4; Antrim, Concord, and Manchester *b*, 13; North Conway and Walpole, 12; Newton, 11. *New Jersey.*—South Orange, 1. *New Mexico.*—Fort Wingate, 14.5. *New York.*—Number Four, 34.8; Utica, 28.7; Spencerport, 24.8; Potsdam, 23.8; Ilion, 22.7; Turin, 21.5; Humphrey, 20.1; Eden, 19; Constableville, 18; Ampersand, 17.6; Canton, 16.9; Sherman, 16.5; North Hammond, 16.3; Brookfield, 15; Palermo

14.5; Kendall, 13; Geneva, 10.8; South Canisteo, 10.7; Fleming, Keene Valley, and Queensbury, 10. *North Carolina.*—Bryson City, 0.5. *North Dakota.*—Bismarck, 8.3. *Ohio.*—Kent, 9. *Oregon.*—Veronia, 68.6; Saint Helen, 60.1; Forest Grove, 39; East Portland, 38; Hood River, 35.9; Portland, 35.3; Beulah, 30; McMinnville and Huntington, 28.5; The Dalles, 28; North Powder, 26; Telocaset, 24.5; Astoria, 22.5; La Grande, 22; Jordan Valley, 20.8; Grass Valley, 15.2; Joseph, 14.5; Hubbard, 14; Baker City, 13.2; Eola and Lone Rock, 12.5. *Pennsylvania.*—Blue Knob, 16; Greenville, 11; Corry and Honesdale, 10. *Rhode Island.*—Bristol, Kingston, and Providence, 4. *South Dakota.*—Spearfish, 21; Canton, 16.5; *Tennessee.*—Cumberland Gap, 0.1. *Texas.*—Fort Elliott, 2. *Utah.*—Corinne, 38; Ogden, 33.5; Salt Lake City, 30.8; Kelton and Nephi, 25; Levan, 19.5; Beaver, 18.5; Promontory, 17; Terrace, 12.5. *Vermont.*—East Berkshire, 23.6; Chelsea, 22; Strafford, 21; Jacksonville, 19; Northfield, 16.8; Brattleborough and Burlington, 16; Lunenburgh, 12; Hartland, 11. *Virginia.*—Bolar, 1. *Washington.*—Fort Spokane, 39; Blakely, 31.8; Vancouver Barracks, 29; Spokane Falls, 24.8; Walla Walla, 22.7; Fort Walla Walla, 20; Fort Canby, 17.5; Fort Townsend, 12.5; Olympia, 12. *West Virginia.*—Buckhannon, 5.8. *Wisconsin.*—Green Bay, 28.4; Embarrass, 28.1; Phillips, 24; Medford, 21.5; Summit Lake, 18; Oshkosh, 14.5; Haywood, 14; Grantsburgh and Waucousta, 12. *Wyoming.*—Camp Sheridan, 52.5; Saratoga, 16; Fort Washakie, 13.6; Fort Bridger, 12.5.

DEPTH OF SNOW ON GROUND AT CLOSE OF MONTH.

Chart iv shows the depth of snow reported on the ground at the close of the month. In New England snow was reported on the ground to southern Massachusetts, and in central New Hampshire and eastern Maine the depth exceeded ten inches. In the middle Atlantic states no snow was reported south of central New York, and in the extreme east-central part of that state a depth of three inches was noted. In the lower lake region trace was reported along the south coast of eastern Lake Ontario and in the southern part of western New York. In the upper lake region there was a depth of over thirty inches in central upper Michigan and east-central Wisconsin, and snow was reported on the ground to central lower Michigan. In the central valleys snow was reported on the ground to east-central Kansas, and there was a depth of ten inches in east-central South Dakota, and a depth of eighteen inches at Saint Vincent, Minn. In the Rocky Mountain and plateau regions snow was reported on the ground to central Colorado, southern Utah, and southern Nevada, and a depth of over forty inches was reported in central Idaho, and a depth of over thirty inches in central and extreme west-central Nevada. In the Pacific coast states snow was reported in the mountains east of the Sacramento River and north of the thirty-eighth parallel, in eastern and northern Oregon, and eastern Washington. In northeastern California and north-central Oregon a depth of more than twenty inches was reported.

HAIL.

Hail was reported as follows: 1st, Ark., 2d, 3d, and 4th, Cal. 5th, Cal., Kans., Me., N. H. 7th, Kans., Mo. 8th, N. Y. 9th, Wash. 11th, Kans., Mass., Mich., N. H., Pa. 12th, Ill., Mo. 14th, Ill. 15th, Mass., N. Y., Pa. 16th, Cal., Oregon. 17th, Cal. 19th, Ark., Cal. 20th, N. H. 21st, Cal., Conn., Pa. 22d, Cal., Ill., N. C. 23d, N. C. 24th, Pa. 25th, Nev., Oregon, Wash. 26th and 27th, Nev. 29th, Ala., Oregon. 30th, Nev., Wash. 31st, Mass.

SLEET.

Sleet was reported as follows: 1st, Ind., N. J. 3d, Ariz., Cal., Iowa, Kans., Mass., Minn. 4th, Cal., D. C., Iowa, Mich., Minn., Mo., Nebr., Wis. 5th, Cal., Iowa, Kans., Minn., Mo., N. Y., N. C., Tex., Vt. 6th, Ill., Ind. T., Kans., Mo., N. H., N. Y. 7th, Ariz., Ill., Ind. T., Kans., Mo., Pa. 8th, Mass., N. Y., Pa. 9th, Ind., Iowa, Ohio, Va. 10th, Mass., Nebr., N. Y., Oregon. 11th, Conn., Iowa, Kans., Mass., Mo., Nebr., N. H., N. Y., Ohio, Pa., Vt. 12th, Cal., Conn., Iowa., Kans., Mich., Mo., N. H., N. Y. 13th, Kans., Mich., Mo., N. H., N. Y., Ohio, Tenn., Vt. 14th, Ariz., Ark., Ill., Ind., Mo., Ohio, Pa., Tenn. 15th, Cal., Conn., Ind., Mass., N. H., N. Y., N. C., Pa., Tenn. 16th, Ind., Me., N. Y., Pa., Tenn. 18th and 19th, Kans. 20th, Ark., Ill., Ind., Ky. 21st, Conn., D. C., Kans., Mass., Mo., N. J., Pa., Tenn., Tex., Va. 22d, Ark., Ill., Ind., Kans., Minn., Mo., N. C., S. C., Tenn. 23d, Conn., Ga., Ind., Ky., Mo., N. Y., N. C., S. C., Tenn., Va. 14th, Kans., Oregon. 26th, Kans. 27th, Mass. 29th, Oregon, S. C., Tenn., Va. 30th, Ohio, Oregon, Pa. 31st., Conn., Mass., Vt.

WINDS.

The prevailing winds during January, 1890, are shown on chart ii by arrows flying with the wind. In New England the winds were mostly from west to northwest; in the middle Atlantic states, the lower lake region, on the middle-eastern slope of the Rocky Mountains, and over the southern plateau region from south to west; in Florida from north to east; in the east and west Gulf states, and on the north Pacific coast, from south to east; in the Ohio Valley and Tennessee, and over the northern plateau region, from southeast to southwest; in the upper lake region from southwest to northwest; in the extreme Northwest and in the Missouri Valley from north to northwest; in the upper Mississippi valley from south to northwest; in the middle plateau region from southeast to northeast; on the middle Pacific coast from southeast to east; on the south Pacific coast from northeast to east; and in the south Atlantic states, and over the northeastern and southeastern slopes of the Rocky Mountains, variable.

HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour were reported at regular stations of the Signal Service as follows: 2d, 50, se., at Fort Canby, Wash. 8th, 68, w., at Buffalo, N. Y. 9th, 56, w., at Cheyenne, Wyo.; 65, nw., at Wood's Holl, Mass.; 66, nw., at Block Island, R. I., and 60, nw., at New Haven, Conn. 12th, 56, sw., at Saint Louis, Mo., and 54, w., at Springfield, Mo. 13th, 50, nw., at Wood's Holl, Mass.; 54, w., at Northfield, Vt.; 52, w., at Oswego, N. Y.; 60, w., at Rochester, N. Y.; 90, sw., at Buffalo, N. Y.; 50, s., at Toledo, Ohio; 72, sw., at Port Huron, Mich.; 58, sw., at Grand Haven, Mich., and 56, nw., at Lexington, Ky. 15th, 50, s., at Fort Canby, Wash. 16th, 55, nw., at Block Island, R. I., and 56, nw., at Wood's Holl, Mass. 20th, 64, w., at Buffalo, N. Y.; 54, w., at Rochester, N. Y.; 52, w., at Port Huron, Mich., and 50, w., at Grand Haven, Mich. 21st, 50, nw., at Buffalo, N. Y. 22d, 56, nw., at Wood's Holl, Mass.; 53, nw., at Block Island, R. I.; 55, nw., at New York City, and 50, nw., at Buffalo, N. Y. 24th, 54, sw., at Marquette, Mich., and 56, w., at Cheyenne, Wyo. 25th, 58, w., at Cheyenne, Wyo., and 51, sw., at Fort Canby, Wash. 26th, 52, s., at Fort Canby, Wash. 27th, 87, s., at Fort Canby, Wash. 28th, 78, s., at Fort Canby, Wash. 29th, 63, s., at Fort Canby, Wash. 30th, 58, s., at Fort Canby, Wash.; 56, w., at Cheyenne, Wyo., and 54, w., at Valentine, Nebr. 31st, 60, s., at Fort Canby, Wash.

LOCAL STORMS.

The most disastrous storms of the month occurred from the middle Mississippi valley to the Great Lakes, and thence eastward to New England during the 12th and 13th, within the area of a low pressure storm which first appeared as a feeble disturbance in the middle Rio Grande valley the night of the 11th, and thence moved northeastward with greatly increased energy, passing over the middle Mississippi valley to Lake

Michigan during the 12th, and over Michigan and Lake Huron during the night of the 12–13th. Destructive local storms occurred at distances varying from one hundred and fifty to three hundred miles to the southward of the centre of the main depression during the afternoon of the 12th. At Saint Louis, Mo., a storm passed over the city at about 5 p. m. (75th meridian time), in a straight line from southwest to northeast, the path of destruction varying in width from five hundred to two thousand feet. The storm was preceded by thunder and lightning, and accompanied by heavy rain which lasted about three minutes. In the path of the storm three persons were killed, several injured, and about one hundred houses blown down or damaged, the greatest damage being done where the path of the storm was narrowest. The maximum wind-velocity at the Signal Service office was 56 miles per hour from the southwest. Crossing the Mississippi River the storm reached Brooklyn, Ill., distant about four miles from Saint Louis, where it caused considerable damage. At about the same hour a storm struck Clinton, Ky., killing ten persons, injuring upward of fifty others, and doing immense damage to buildings, many of the smaller of which were lifted bodily from their foundations. The path of the storm at Clinton was about three hundred yards wide. Great destruction was also caused at other places in western Kentucky, notably at Wickliffe and Moscow, and at points in the middle Mississippi and Ohio valleys. On the 12th a heavy snow storm, with high wind and falling temperature, prevailed over Minnesota, the Dakotas, Nebraska, Kansas, and Iowa, which, from Minnesota and the Dakotas southwestward over Kansas, was a veritable "blizzard," the snow drifting heavily and causing a general blockade of the railroads. On the 12th and 13th the storm along the lower lakes and over Lake Huron was one of the severest experienced in many years, and was attended by fatalities and great destruction of property. At Springfield, Ill., the wind reached a maximum velocity of forty-four miles per hour from the southwest at 2.15 a. m. of the 13th. At Port Huron, Mich., a maximum velocity of seventy-two miles per hour from the southwest was registered at 7.35 a. m. of the 13th, and the storm was reported the severest that had been experienced at that place since the opening of the Signal Service station in 1874. At Buffalo, N. Y., the storm was reported the severest since the opening of the Signal Service station in 1870; the wind attained a maximum velocity of ninety miles per hour from the southwest at 11.15 a. m. of the 13th; great damage was caused to property in the city and vicinity, and the water in Lake Erie reached a height 7.6 feet above the mean water mark at 2.30 p. m. of the 13th, flooding that portion of the city called "the Island." At Rochester, N. Y., the anemometer became disabled at 10 a. m. of the 13th, at which time a velocity of sixty miles per hour from the west was recorded. At Oswego, N. Y., the storm was reported the most destructive of the season. The wind reached a maximum velocity of fifty-two miles per hour from the west at 2.11 p. m. of the 13th; several buildings were unroofed and other damage done. Severe disturbances also occurred over the Lake region during the 19th and 20th.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS AND HARBORS.

The following table shows the danger-points at the several stations; the highest and lowest water during January, 1890, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, January, 1890 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La.	29.9	18	21.0	2	10.8	10.2
Arkansas River:						
Fort Smith, Ark.	22.0	16	14.2	1, 2	1.8	12.4
Little Rock, Ark.	23.0	18	17.3	1	4.2	13.1
Missouri River:						
Ft. Buford, N. Dak*	.....	.....	.....	.....	.....	.....
Kansas City, Mo.	21.0	31	6.9	8	0.2	6.7
Mississippi River:						
Saint Paul, Minn*.	14.5	.....	.....	.....	.....	.....
La Crosse, Wis*.	24.0	.....	.....	.....	.....	.....
Dubuque, Iowa*.	16.0	.....	.....	.....	.....	.....
Davenport, Iowa.	15.0	14	2.2	5	— 1.0	3.2
Keokuk, Iowa	14.0	29	6.0	8, 9	— 2.4	8.4
Saint Louis, Mo.	32.0	18	14.4	1	5.0	9.4
Cairo, Ill.	40.0	20, 21	43.7	2	18.5	25.2
Memphis, Tenn.	34.0	26	34.6	2	14.4	20.2
Vicksburg, Miss.	41.0	31	41.5	5	19.1	22.4
New Orleans, La.	13.0	31	13.3	5, 6, 7	5.9	7.4
Ohio River:						
Pittsburgh, Pa.	22.0	16	20.0	2	5.6	14.4
Parkersburg, W. Va.	38.0	18	29.9	3	8.9	21.0
Cincinnati, Ohio	50.0	21	43.8	5	18.9	24.9
Louisville, Ky.	25.0	22	20.2	2	9.2	11.0
Cumberland River:						
Nashville, Tenn.	40.0	22	36.3	11, 12	9.0	27.3
Tennessee River:						
Chattanooga, Tenn.	33.0	23	13.0	8, 12, 13, 15	4.6	8.4
Knoxville, Tenn.	29.0	24	7.3	12	1.5	3.8
Monongahela River:						
Pittsburgh, Pa.	29.0	16	20.0	2	5.6	14.4
Savannah River:						
Augusta, Ga.	32.0	31	9.4	26, 29	6.8	2.6
Willamette River:						
Portland, Oregon.	15.0	31	10.0	6	0.8	9.2

*Frozen.

The above table shows that the water was 3.7 above the danger-point at Cairo, Ill., on the 20th and 21st; 0.6 above at Memphis, Tenn., on the 26th; 0.5 above at Vicksburg, Miss., and 0.3 above at New Orleans, La., on the 31st.

ICE IN RIVERS AND HARBORS.

Lake Michigan.—Sheboygan, Wis.: the lake was entirely free from ice on the 3d, and boats could have passed through the straits. Small vessels were freighting lumber between Duncan and points above. Milwaukee, Wis.: a steamer arrived from Port Huron, Mich., on the 6th. This was the first arrival from a lower lake port in 1890, and the earliest arrival on record. Reports show that the Straits of Macinac were still open to navigation on the 31st, a condition never before known at that season of the year.

Thunder Bay.—Alpena, Mich.: Thunder Bay and Thunder River froze over on the 16th, closing navigation.

Lake Ontario.—Oswego, N. Y.: a schooner arrived from Kingston, Ontario, on the 16th, and the same boat returned to Kingston on the 18th. This was the latest trip made on Lake Ontario by either steam or sailing vessels in ten years.

Machias River.—Machias, Me.: the river was closed to navigation by ice on the 12th.

Saco River.—Biddeford, Me.: the river was closed to navigation by ice during the night of December 31st. The shipping season was reported the longest ever known at that place.

Detroit River.—Detroit, Mich.: floating ice in river, 25th and 26th.

Saint Mary's River.—Sault de Ste. Marie, Mich.: the river froze over for the first time this season on the 9th.

Mississippi River.—Davenport, Iowa: floating ice in river, 6th, 7th, and 8th. The river froze over on the 16th.

Missouri River.—Kansas City, Mo.: an ice gorge in the river at, and above, Saint Joseph, Mo., in the early part of the month, lowered the stage of the water at Kansas City to a point about two feet below the record, exposing the main suction pipe of the water works. Floating ice in river, 28th, 29th, and 30th.

LOW TIDE.

New London, Conn., 22d: owing to the strong northwest wind, the tide was very low in the harbor. Norwich, Conn.: the tide was lower in the Thames River on the afternoon of the 22d than it had been for several years.

FLOODS.

Continuous heavy rain during the first few days of the month caused floods in parts of southern Missouri, eastern Arkansas, and northern and eastern Texas, which destroyed property to the value of millions of dollars; and during the first decade of the month heavy rain caused streams in central, southern, and western Illinois, and southern Indiana to overflow their banks, entailing considerable damage to farming and railroad property. Reports of the 15th and 16th stated that many of the smaller streams in western Pennsylvania and West Virginia were over their banks and doing much damage; and reports from Carmi, Ill., dated the 16th, stated that a portion of that city was flooded and that lowlands were under water by an overflow of the Little Wabash River. A report from Eureka, Cal., dated the 13th, stated that in consequence of the continuous heavy rain the rivers in that vicinity were flooding the lowlands, sweeping away bridges, and doing other damage, and a report from the same place dated the 24th stated that the Eel River had overflowed its banks, and that a considerable area of the valley was under water. On the 25th a portion of Los Angeles, Cal., was flooded by a rise in the Los Angeles River; portions of the levee were washed away and washouts occurred on the railroads. During the latter part of the month warm rains melted a large amount of snow in the Sierra Nevada and Siskiyou mountains in northern California, causing streams to overflow their banks, washing away railroad bridges and levees, filling cuts, flooding towns, and causing land slides. The damage was especially heavy in Sacramento, Sonoma, Napa, Solano, and Santa Clara counties, and in the San Joaquin Valley. On the 27th a small portion of Fresno, Cal., was flooded, and the canals in that region overflowed, flooding large tracks of country.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Yankton, S. Dak.: an almost perfect auroral corona was observed from 8 to 8.20 p. m., 11th. The beams, twelve in number, were of a white light and shot up from near the horizon to the zenith from all quarters of the sky except due south.

Northfield, Minn.: an aurora was observed at 4.35 a. m., 18th, eastern time. The display was evidently an extensive one, as the light was very bright in the horizon, and extended 45° east and west of the north point. A pall of black clouds hung like a curtain over the upper portion of the aurora.

Fort Buford, N. Dak.: an auroral band, in the form of an arch of light gray color, was observed at 10.30 p. m., 18th. At that time the arch had an altitude of 10°, and rose steadily until it reached altitude 20°, when it covered 65° of the horizon between northwest and northeast. The aurora continued into the night. A slight auroral light was observed on the 21st.

Fort Custer, Mont.: a faint aurora was visible in the north from 9.45 p. m. to 11.30 p. m., 20th. The display was in the form of a wavy curtain of a diffuse light which rose to altitude 12°, and extended from azimuth 180° to 216°.

Auroras were observed during the month as follows: 2d, Morris, Minn. 3d, Hess Road Station, N. Y. 11th, Yankton, S. Dak. 17th, Voluntown, Conn.; Davenport, Iowa; Cornish, Eastport, and Orono, Me.; Leicester and Newburyport, Mass.; New England City and Steele, N. Dak.; Scranton and Webster, S. Dak. 18th, Orono, Me.; Northfield, Minn.; Glendive, Mont.; Fort Buford and New England City, N. Dak.; Scranton, S. Dak. 20th, Fort Custer, Mont.; Egg Harbor City, N. J. 21st, Davenport and Wesley, Iowa; Orono, Me.; Moorhead, Minn.; Fort Buford, N. Dak. 23d, Morris, Minn. 28th, Nashua, N. H. 30th, Era, Idaho. 31st, Morris, Minn.; North Hammond, N. Y.

ZODIACAL LIGHT.

Northfield, Minn., 20th: the zodiacal light is quite brilliant in the western sky at this season of the year. The light has a whitish color and extends half way from the horizon to the Pleiades, its shape being slightly parabolic, with the vertex in the sky, sloping off to the northward. It has been learned that at this season of the year the light is usually quite as brilliant as it is now, and attempts have been made to photograph it here.

THUNDER-STORMS.

No severe or destructive thunder-storms were reported during the month. East of the Rocky Mountains thunder-storms were reported in the greatest number of states and territories, eleven, on the 12th; in eight on the 1st, 2d, and 19th; in five on the 20th, and in from one to four, inclusive, on the 3d to 8th, 10th, 11th, 13th to 16th, 18th, 20th, 22d, 24th, 25th, 28th, 29th, and 31st. No thunder-storms were reported east of the Rocky Mountains on the 9th, 17th, 21st, 23d, 26th, 27th, and 30th.

East of the Rocky Mountains thunder-storms were reported on the greatest number of dates, nine, in Illinois; on eight in Louisiana and Tennessee; on seven in Arkansas, Kansas, and Texas; on from one to six, inclusive, in Alabama, Connecticut, Indiana, Indian Territory, Iowa, Kentucky, Mississippi, Missouri, New York, Ohio, Pennsylvania, and Vermont. In states and territories other than those named no thunder-storms were reported. The only states west of the Rocky Mountains reporting thunder-storms during the month were: California, on the 3d, 17th, 22d, 23d, and 24th; Montana, on the 1st and 29th, and Washington, on the 1st.

MISCELLANEOUS PHENOMENA.

DROUGHT.

Bermuda, Ala., 31st: owing to dry weather small streams in this section have become dry, which is an unusual occurrence at this season of the year.

Matanzas, Fla.: this month has been remarkable for long continued droughts. The orange crop has been damaged to a considerable extent.

HALOS.

Fort Custer, Mont., 14th: a brilliant solar halo of 22° radius was visible from soon after sunrise until 4 p. m. During a portion of the time, particularly about noon, a second halo of 46° radius was also visible. This halo was partial, the upper segment alone being visible; a parhelic circle passed through both halos, causing bright parhelia at each point of intersection. A vertical column also passed through the sun, its appearance, with the parhelic circle, dividing the halo of 22° radius into four segments.

Solar and lunar halos were reported in the Atlantic coast states, mostly in New England and the middle Atlantic states, on twenty-two dates. On twenty-one dates rain or snow fell in that region on the dates for which the halos were reported; on twenty dates on the second day; and on eighteen dates on the third day following the halos. In the central valleys halos were reported, mostly north of the thirty-fifth parallel, for twenty-nine dates. On twenty-six dates rain or snow fell on the dates for which the halos were reported; on twenty-six dates on the second day; and on twenty-three dates on the

third day following the halos. In the Rocky Mountain and plateau regions halos were reported, mostly in the upper Missouri valley, on thirteen dates. On nine dates rain or snow fell on the same day; on six dates on the second day; and on one date on the third day following the halos. On the Pacific coast halos were reported, mostly on the north Pacific coast, on thirteen dates. On ten dates rain fell on the same day; on seven dates on the second day; and on five dates on the third day following the halos. The above statement shows that in the Atlantic coast states 96 per cent. of the halos were attended by rain or snow on the same date; that 90 per cent. were followed on the second date, and 82 per cent. on the third date by rain or snow. In the central valleys 90 per cent. of the halos were attended by rain or snow on the same date; 90 per cent. were followed on the second date; and 79 per cent. on the third date by rain or snow. In the Rocky Mountain and plateau regions 69 per cent. of the halos were attended by rain or snow on the same date; 46 per cent. were followed on the second date, and 8 per cent. on the third date by rain or snow. On the Pacific coast 77 per cent. of the halos were attended by rain or snow on the same date; 54 per cent. were followed on the second date, and 38 per cent. on the third date by rain or snow. It is also shown that in the Atlantic coast states 50 per cent. of the halos appeared in advance of low pressure storms, and 50 per cent. were reported following the passage of storm areas or within areas of high pressure. In the central valleys 38 per cent. of the halos appeared to the eastward of low pressure storms, and 62 per cent. were observed in the west quadrants of low pressure storms or within areas of high pressure. In the Rocky Mountain and plateau regions 46 per cent. of the halos appeared in the eastern quadrants, and 54 per cent. to the westward of low pressure storms. On the Pacific coast but 8 per cent. of the halos attended or preceded the approach of low pressure storms, while 92 per cent. were noted to the west or northwest of areas of low pressure.

It therefore appears that the halos of the current month generally occurred within the influence of low pressure storms; that in practically every instance rain or snow fell at or near the stations reporting halos on the date of their occurrence; that the rain or snow of the second and third dates following the halos attended the disturbed and humid condition of the atmosphere following general disturbances; and that the halos occurred most frequently in the west quadrants of areas of low pressure.

METEORS.

Brilliant meteors were reported as follows: 8th, New London, Conn. 13th, Spearfish, S. Dak. 14th, Buffalo and Rochester, N. Y. 24th, Cumberland and Woodstock, Md. 25th, Galena, Md. Meteors were also reported on the 2d, at Clinton and Fayette, Iowa. 3d, Peoria, Ill. 8th, New London, Conn., and Sioux City, Iowa. 13th, Woodbury, N. J. 14th, Ithaca, N. Y., and Catawissa, Pa. 15th, Beverly, N. J. 18th, McCausland, Iowa, and Yellow Springs, Ohio. 20th, Dubuque, Iowa. 29th and 30th, Dale Enterprise, Va.

MIRAGE.

Mirage were observed during the month as follows: 3d, Wahpeton, N. Dak. 7th, Tribune, Kans.; Wolsey, S. Dak. 9th, Woonsocket, S. Dak. 12th, Napoleon, N. Dak. 13th, Woonsocket, S. Dak. 17th, Sundance, Wyo. 18th, Hay Springs, Nebr. 23d, Tribune, Kans. 25th and 26th, Woonsocket, S. Dak. 27th, Napoleon, N. Dak.; Webster and Woonsocket, S. Dak. 28th and 29th, Tribune, Kans.; Woonsocket, S. Dak. 30th and 31st, Woonsocket, S. Dak.

Spearfish, S. Dak.: a very fine mirage occurred on the 5th, beginning about 8 a. m. and lasting nearly an hour. The ground west and northwest of Crow Peak, and between this place and Beulah, seemed to be lifted hundreds of feet above all the intervening high land which ordinarily shuts them off from view, and every belt of timber, ravine, or gulch, the course of the Redwater for miles, and even the ranches with smoke ascending from dwellings, were plainly seen.

Wolsey, S. Dak.: on the 25th, at 3 p. m., and on the 28th, from 8 a. m. to 10 a. m., unusually bright and distinct mirage were seen. The country for fifteen to twenty miles in every direction was plainly presented to view, and a freight train of ten cars, twelve miles distant could be seen.

SUN SPOTS.

Haverford College Observatory, Pa. (observed by Prof. F. P. Leavenworth):

Date.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.	Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	
Jan., 1890.										
3, 11 a. m.	0	0	0	0	0	0	1	1	0	Definition poor.
4, 11 a. m.	0	0	0	0	0	0	1	1	0	Definition poor.
6, 11 a. m.	0	0	0	0	0	0	1	1	0	Definition very poor.
8, 11 a. m.	0	2	0	0	0	0	1	3	1	Definition poor.
9, 10 a. m.	1	2	7	3	0	0	1	2	0	Definition very poor.
11, 3 p. m.	0	0	0	0	0	0	0	0	2	Definition good.
12, 3 p. m.	2	3	0	0	0	0	2	3	4	Definition fine, spots small.
13, 3 p. m.	0	0	0	0	0	0	0	0	2	Definition fair.
14, 11 a. m.	0	0	0	0	0	0	0	0	0	Definition poor.
16, 2 p. m.	1	6	0	0	0	0	1	6	2	Definition fair, spots small.
17, 10 a. m.	0	2	0	0	0	0	1	8	3	Definition good.
18, 12 m.	0	6	0	0	0	0	1	14	1	Definition fine.
19, 11 a. m.	0	10	0	0	0	0	1	24	0	Definition fine, 2 large spots.
21, 1 p. m.	0	0	0	0	0	0	1	6	1	Definition good, 1 large spot.
22, 11 a. m.	0	0	0	0	0	0	1	2	1	Definition poor.
24, 9 a. m.	0	0	1	2	0	0	0	0	4	Definition poor.
25, 2 p. m.	0	0	0	0	0	0	0	0	0	Definition very poor.
27, 9 a. m.	0	0	0	0	0	0	0	0	3	Definition poor.
28, 10 a. m.	0	0	0	0	0	0	0	0	3	Definition poor.
29, 10 a. m.	0	0	0	0	0	0	0	0	0	Definition poor.
30, 11 a. m.	1	4	0	0	0	0	1	4	1	Definition good.

Mr. C. E. Buzzell, Leaf River, Ill.: the group of December 27th was observed January 2d and 3d. Clouds, 4th to 7th. 9th, two small spots observed in high latitude one day past meridian. Clouds, 10th, 11th, 12th. 16th, one small spot in low latitude one day west of meridian, increasing on 18th and forming three groups on 20th; passed west limb 21st. Clouds, 22d to 26th. 30th, small group one day in on east limb, increasing to two groups on 31st, and subsiding to one small group on February 1st.

Mr. John W. James, Riley, Ill.: a large single spot on the sun's meridian 1st to 2d; disappeared by solar rotation, 7th or 8th. None seen the rest of the month.

Mr. M. A. Vedder, Lyons, N. Y.: the large spot that appeared by rotation on December, 26th was seen nearing the western limb on January 4th. On January 20th and 21st two large spots were seen close to the western limb; this disturbance probably appeared by rotation on January 9th, spots forming during the transit. Faint groups of faculæ were seen near the eastern limb on January 14th and 28th. Observations were poor or lacking on nearly all other days.

Mr. H. D. Gowey, North Lewisburgh, Ohio: sun spots 3d, 21st.

VERIFICATIONS.

FORECASTS FOR 24 HOURS IN ADVANCE.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

The forecasts for districts east of the Rocky Mountains for January, 1890, were made by Captain H. H. C. Dunwoody, 4th Artillery, Signal Officer, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps.

Percentages of forecasts verified, January, 1890.

States.		States.	
Maine	84.0	Kentucky	84.1
New Hampshire	84.1	Ohio	84.5
Vermont	84.2	West Virginia	84.9
Massachusetts	86.1	Indiana	87.7
Rhode Island	83.7	Illinois	85.3
Connecticut	80.4	Lower Michigan	85.3
Eastern New York	83.0	Upper Michigan	82.1
Western New York	82.4	Wisconsin	84.7
Eastern Pennsylvania	86.3	Minnesota	82.9
Western Pennsylvania	83.7	Iowa	84.1
New Jersey	81.9	Kansas	87.4
Delaware	82.5	Nebraska	83.4
Maryland	84.4	Missouri	85.0
District of Columbia	85.7	Colorado	82.8
Virginia	87.4	North Dakota	78.7
North Carolina	88.5	South Dakota	81.7
South Carolina	87.2	Southern California*	88.3
Georgia	89.1	Northern California*	86.9
Eastern Florida	95.2	Oregon*	90.8
Western Florida	94.3	Washington*	87.8
Alabama	89.5	*By elements:* Weather	85.8
Mississippi	86.8	Temperature†	84.5
Louisiana	87.0	Monthly percentage of weather and temperature combined‡	85.3
Texas	90.2		
Arkansas	87.5		
Tennessee	84.1		

* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The forecasts of temperature in districts east of the Rocky Mountains for January, 1890, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. ‡ The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

FORECASTS FOR 48 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for forty-eight and seventy-two hours, covering the second and third days in advance. Such forecasts are optional with the predicting officer, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 2; temperature, 51. Percentages of verifications: weather, 100; temperature, 85.7. Weather and temperature combined, 86.5.

No forecasts for seventy-two hours were made during the month.

CAUTIONARY SIGNALS FOR JANUARY, 1890.

Statement showing percentages of justifications of wind signals for the month of January, 1890:

Wind signals.—(Ordered by Captain H. H. C. Dunwoody.) Total number of signals ordered, ninety; justified as to velocity, wholly, seventy-six, partly, four; justified as to direction, eighty-three. Of the signals ordered, sixty-two were cautionary, of which fifty-two were wholly, and two partly, justified; and twenty-eight were storm signals, of which twenty-four were wholly, and two partly, justified. Sixteen signals were ordered for easterly winds, of which twelve were justified, and seventy-four were ordered for westerly winds, of which seventy-one were justified. Percentage of justifications, 74.7.

Cold-wave signals.—(Ordered by Assistant Professor T. Russell.) Total number of signals ordered, three hundred and ninety-five; justified, two hundred and sixty-three. Percentages of justifications, 66.6.

Percentages of local verifications of weather and temperature signals reported by directors of the various State Weather Services for January, 1890.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Indiana	83.0	85.0	New Jersey	86.9	88.2
Kansas	88.9	91.0	New York	88.5	84.0
Michigan	82.4	75.5	Ohio	88.0	86.0
Minnesota	81.0	82.0	Pennsylvania	85.0	83.0
Missouri	86.0	85.0	South Carolina	80.0	87.8
Nebraska	89.8	91.8			

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts and summaries are republished from reports for January, 1890, of the directors of the various state weather services:

ALABAMA.

The weather was spring-like throughout the month, and the rainfall was small for a winter month.

Temperature.—Highest monthly mean, 63, at Citronelle; lowest monthly mean, 49, at Valley Head; maximum, 84, at Citronelle, 7th; minimum, 17, at Elkmont, 22d; greatest local monthly range, 58, at Citronelle and Elkmont; least local monthly range, 44, at Mobile.

Precipitation.—Greatest monthly, 6.33, at Tuscumbia; least, 0.60, at Mobile.

Wind.—Prevailing directions, south and southwest.—*P. H. Mell, Signal Corps, Auburn, director.*

ARKANSAS.

Temperature.—The average was 8.1 higher than for January, 1889. Highest monthly mean, 56.2, at Washington; lowest monthly mean, 40.2, at Winslow; maximum, 81, at Lead Hill, 26th; minimum, 10, at Winslow, 16th.

Precipitation.—The average precipitation was one inch greater than that of last year. Greatest monthly, 9.46, at Ozone; least monthly, 3.97, at Fort Smith.—*M. F. Locke, Commissioner of Agriculture, Little Rock, director; W. U. Simons, Sergeant, Signal Corps, assistant.*

COLORADO.

Temperature.—The monthly mean for the state was 4 above the average of the last three years. Highest monthly mean, 33.4, at Cañon City; lowest monthly mean, 4.5, at Gunnison; maximum, 84, at Breckenridge; minimum, —39, at Gunnison; greatest local monthly range, 110, at Breckenridge; least local monthly range, 45, at Moraine.

Precipitation.—The monthly precipitation was about the average; greatest monthly, 2.08, at Durango; least monthly, 0.00, at Monte Vista.

Wind.—Prevailing direction, west.—*Prof. F. H. Loud, Colorado Springs, director; W. S. Miller, Corporal, Signal Corps, assistant.*

ILLINOIS.

Temperature.—The mean temperature for the month was 10 above the normal of the past fifteen years; maximum, 74, at Jordan's Grove, Mascoutah, and McLeansborough, 12th; minimum, —13, at Woodstock, 22d.

Precipitation—The average for the month was about 3.37 above the normal of the past twelve years; greatest monthly, 14.62, at Atwood; least monthly, 1.64, at Sycamore.

Wind.—Prevailing direction, northwest.—*John Craig, Sergeant, Signal Corps, Springfield, in charge.*

INDIANA.

Temperature.—The month was warm throughout; the mean temperature is the highest on record for any month of January for the last nine years, except January, 1880, which was warmer; highest monthly mean, 45.7, at Marengo; lowest monthly mean, 33.5, at Logansport; maximum, 72, at Scalesville, 11th; minimum, —3, at La Fayette, 24th; greatest local monthly range, 73, at LaFayette; least local monthly range, 51, at Marengo.

Precipitation.—The precipitation, mainly in the form of rain, was greatly in excess, in fact the amounts are the greatest ever measured in Indiana in any January on record; the average excess above the normal is 3.76; greatest monthly, 11.90, at Huntingburgh; least monthly, 2.48, at Logansport.

Wind.—Prevailing direction, southwest.—*Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.*

IOWA WEATHER CROP BULLETIN SERVICE.

Temperature.—Highest monthly mean, 28.9, at Keokuk; lowest monthly mean, 11.2, at Larrabee; maximum, 64, at Keokuk, 11th; minimum, —27, at Fayette, 22d; greatest local monthly range, 81, at Glenwood; least local monthly range, 56, at Maquoketa.

Precipitation.—Greatest, 3.80, at Grinnell; least, 0.99, at Larrabee.

Wind.—Prevailing direction, northwest.—*G. M. Chappel, Sergeant, Signal Corps, Des Moines, in charge, Iowa Weather Crop Bulletin Service.*

KANSAS.

Temperature.—The mean temperature for the month was 2 above the normal; highest monthly mean, 37.8, at Oswego; lowest monthly mean, 19.4, near Concordia; maximum, 79, at Englewood, 9th and 30th; minimum, —22,

at Seneca, 16th; greatest local monthly range, 88, at Scott City; least local monthly range, 60, at Buffalo Park; greatest daily range, 57, at Gove City, 1st; least daily range, 3, at Dodge City, 12th, and at Kellogg, 26th.

Precipitation.—Greatest, 3.73, at Marmaton; least, 0.10, at Weskan.

Wind.—Prevailing direction, northwest.—*Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

KENTUCKY.

The month was characterized by an excess of rainy and cloudy days.

Temperature.—The temperature was 10 above the normal for the month; maximum, 77, at Pellville, 4th; minimum, 10, at Owenton, 22d; greatest monthly range, 58, at Pellville, Richmond, and Louisville; least monthly range, 50, at Franklin.

Precipitation.—Greatest, 7.69, at Murray; least, 3.66, at Ashland.

Wind.—Prevailing direction, south.—*Dr. E. A. Grant, Louisville, director, Frank Burke, Sergeant, Signal Corps, assistant.*

LOUISIANA.

Temperature.—The average temperature was nearly 14 above the January normal for the northern section, and a little over 10 for the southern section. Highest monthly mean, 66.3, at New Iberia; lowest monthly mean, 56.4, at Farmerville; maximum, 88, at Convent, 27th; minimum, 21, at Minden, 16th; greatest local monthly range, 59, at Amite; least local monthly range, 30, at Port Eads.

Precipitation.—The deficiency in northern Louisiana is about 0.25, and in southern Louisiana a little over 4.00; greatest, 8.38, at Coushatta; least, 0.61, at Thibodeaux.

Wind.—Prevailing direction, south.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

MICHIGAN.

The features of the month are the high temperature, excess in rainfall, and the lack of snowfall in the central and southern portions of the state.

Temperature.—The mean temperature was 7.6 above the normal of fifteen years; highest monthly mean, 36.7, at Benton Harbor; lowest monthly mean, 12.6, at Atlantic; maximum, 68, at Williamston, 16th; minimum, —20, at Crystal Falls, 22d; greatest local monthly range, 64, at Williamston; least local monthly range, 34, at Gaylord; greatest daily range, 46, at Gulliver Lake, 18th; least daily range, 0, at Ypsilanti, 6th.

Precipitation.—The average for the month was 1.17 above the normal of fifteen years; greatest, 5.90, at Atlantic; least, 1.41, at Hayes.

Wind.—Prevailing direction, southwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, director.*

MINNESOTA.

In the southeastern part of the state, and at Moorhead, the temperature was about 2 above the normal, while in other portions of the state it was from 2 to 3 colder than usual. The precipitation was greatly in excess at Saint Vincent; there was a considerable deficiency at Moorhead; in other portions of the state the departures were not remarkable.

Temperature.—Highest monthly mean, 16.8; lowest monthly mean, —9.3, at Saint Vincent; maximum, 49, at Mankato; minimum, —38, at Saint Vincent, 7th and 21st, and at Pokegama Falls, 16th; greatest local monthly range, 83, at Pokegama Falls; least local monthly range, 61, at Rolling Green.

Precipitation.—Greatest, 1.98, at Saint Vincent; least, 0.10, at Morris.

Wind.—Prevailing direction, northwest.—*John Healy, Private, Signal Corps, Saint Paul, in charge.*

MISSISSIPPI.

Temperature.—The mean temperature for the month was 11.4 above the normal; maximum, 88, at Summit, 10th; minimum, 20, at Louisville, 17th. The daily range of temperature was generally small, being less than 10 on eight days, and less than 16 on twenty days.

Precipitation.—The rainfall was very unequally distributed, the northern section getting nearly its normal, while the southern section received very much less than the normal amount.

Wind.—Prevailing direction, south or southeast—*R. B. Fulton, Signal Corps, University, director.*

MISSOURI.

Temperature.—Maximum, 81, at Protem; minimum, —16, at Langdon.

Precipitation.—The greatest rainfall occurred along the Missouri and Mississippi rivers from New Haven to Genevieve, and southwestwardly from the latter place to Ironton, both of which report 10.5. The rainfall decreased to the west and northwest parts of the state to from 2.00 to 3.00.—*Prof. Francis E. Nipher, Saint Louis, director.*

METEOROLOGICAL REPORT OF THE MISSOURI STATE BOARD OF AGRICULTURE.

The month was noted for the high temperature and excessively heavy rains.

Temperature.—The temperature ranged from 3 in the northern, to 12 in the southern, portion above the normal for January; Highest monthly mean, 45.6, at Protem; lowest monthly mean, 21.8, at Oregon; maximum, 81, at Protem, 26th; minimum, —19, at Conception, 11th; greatest local monthly range, 81, at Oregon; least local monthly range, 56, at Warrenton, Kans.

Precipitation.—Greatest, 10.50, at Ironton and New Haven; least, 1.27, at Leavenworth, Kans.

Wind.—Prevailing direction, south.—*Levi Chubbuck, Secretary of State Board of Agriculture, Columbia, director; A. L. McRae, Sergeant, Signal Corps, assistant.*

NEBRASKA.

Temperature.—The month opened and closed with mild pleasant weather, and cold weather prevailed from the 12th to the 24th; maximum, 72, at Mullen; minimum, —34, at Fort Niobrara.

Precipitation.—Over 2.00 fell in the southeastern portion of the state, from 1.00 to 2.00 in the east-central portion, and less than one inch in the remainder of the state, including a small area in Saunders and adjacent counties.—*Prof. Goodwin D. Swezey, Crete, director; G. A. Loveland, Sergeant, Signal Corps, assistant.*

NEVADA.

Temperature.—The month has been characterized by low temperature and heavy snow. The mean temperature for the state is 2.7 below the normal; maximum, 73, at El Dorado Canyon, 28th; minimum, —42, at Elko; these extremes were very severe on all stock on the ranges throughout the northern portion of the state.

Precipitation.—The precipitation was generally in the form of snow and very heavy, except in the southern portion of the state, where light rain occurred. The average for the state was 1.59 above the normal for the month; greatest, 9.30, at Ruby Hill; least, 0.49, at El Dorado Canyon.

Wind.—Prevailing direction, south.—*Prof. Chas. W. Friend, Carson City, director; H. E. Wilkinson, Corporal, Signal Corps, assistant.*

NEW ENGLAND METEOROLOGICAL SOCIETY.

The weather in New England during January may be characterized as cloudy, very warm, and dry. The average temperature for January for twenty-five stations, having records for more than ten years, was 5.4 above the normal.

Temperature.—Highest monthly mean, 37.9, at Block Island; lowest monthly mean, 16.0, at Fairfield; maximum, 69, at Olneyville, 12th; minimum, —23, at Orono, 10th; greatest local monthly range, 81, at Orono; least local monthly range, 39, at Nantucket; greatest daily range, 56, at West Milan, 25th; least daily range, 0, at Calais, 16th.

Precipitation.—Greatest, 4.66, at West Milan; least, 1.26, at Shelton. The average precipitation for January for thirty-four stations, having records for more than ten years, was 1.17 below the normal.

Wind.—Prevailing direction, northwest.—*Prof. William H. Niles, Boston Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; L. G. Schultz, Sergeant, Signal Corps, assistant.*

NEW JERSEY.

Temperature.—The mean temperature for the month was 11.8 above the average; highest monthly mean, 45.3, at Cape May C. H.; lowest monthly mean, 37.1, at Madison; maximum, 78, at Cape May C. H., 12th; minimum, 12, at Highland Park, 22d; greatest local monthly range, 61.3, at Egg Harbor City; least local monthly range, 45.5, at New Brunswick; greatest daily range, 43, at Cape May C. H., 13th; least daily range, 0.5, at Princeton, 3d.

Precipitation.—The average for the month is 0.65 below the normal; greatest, 3.22, at Plainfield; least, 1.05, at Asbury Park.

Wind.—Prevailing directions, northwest and southwest.—*E. W. McGann, Sergeant, Signal Corps, New Brunswick, in charge.*

NEW YORK.

Temperature.—Maximum, 69, at West Point, 3d; minimum, —15, at Plattsburgh Barracks, 10th and 11th; greatest local monthly range, 79, at Plattsburgh Barracks; least local monthly range, 45.1, at Madison Barracks and Sacket's Harbor. The monthly mean temperature was everywhere above the normal.

Precipitation.—The rainfall was generally above the average, excepting in the Hudson Valley, where large deficiencies were reported; greatest monthly, 7.24, at Constableville; least monthly, 0.99, at Ardenia.

Wind.—Prevailing direction, west.—*Prof. E. A. Fuertes, Ithaca, director; I. W. Brewer, Private, Signal Corps, assistant.*

NORTH CAROLINA.

The mean temperature for the month was 10 above the normal, and the rainfall was 4.00 below the average.

Temperature.—Highest monthly mean, 57.2, at Wilmington and Blackman's Mills; lowest monthly mean, 41.7, at Highlands; maximum, 85, at Clarkton, 27th; minimum, 10, at Highlands, 17th; greatest local monthly range, 66, at Clarkton; least local monthly range, 41, at Southport and Hatteras.

Precipitation.—The rainfall was most abundant in the western portion of the state, but did not reach the normal there; greatest monthly, 4.68, at Chattanooga, Tenn; least monthly, 0.33, at Blackman's Mills.

Wind.—Prevailing direction, southwest.—*Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Sergeant, Signal Corps, assistant.*

NORTH AND SOUTH DAKOTA.

Temperature.—The monthly mean temperature was 6 below the normal; highest monthly mean, 14.8, at Spearfish, S. Dak; lowest monthly mean, —9.3, at Saint Vincent, Minn; maximum, 59, at Valentine, Nebr., 30th; minimum, —40, at Gallatin, N. Dak; greatest local monthly range, 83, at Valentine, Nebr.; least local monthly range, 59, at De Smet, S. Dak; greatest daily range, 53, at Fort Buford, N. Dak., 24th; least daily range, 4, at Valentine, Nebr., 14th.

Precipitation.—The monthly average for the state was about 0.13 above the normal; greatest monthly, 2.10, at Spearfish, S. Dak.; least monthly, 0.00, at Millbank, S. Dak.—*S. W. Glenn, Sergeant, Signal Corps, Huron, in charge.*

OHIO.

Temperature.—This was the warmest January of which there is any record in the bureau. The mean temperature in the northern, middle, and southern

sections was 12.0, 12.3, and 12.3, above the average for the sections. The mean for the state was 12.2 above the average for January; maximum, 75, at Hanging Rock, 12th; minimum, 0.7, at Wauseon, 22d; greatest daily range, 49.3, at Toledo, 13th; least daily range, 3, at Columbus, 27th, New Alexandria, 6th, and Cleveland, 7th.

Precipitation.—The precipitation in the northern, middle, and southern sections was 1.22, 1.77, and 1.98 above the average for the sections. The mean for the state was the heaviest rainfall on record for January, and 1.66 above the average; the greatest monthly, 8.33, at West Milan, is the largest rainfall ever reported from a station of the bureau for January.—*Prof. B. F. Thomas, Columbus, director; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Corporal, Signal Corps, assistant.*

OREGON.

The month was remarkable for its general low temperature, and western Oregon for its excessive precipitation.

Temperature.—The mean temperature was 5.9 below the normal, the departures ranging from 3.3, at Albany, to 8.3, at The Dalles. Highest monthly mean, 38.9, at Gardiner; lowest monthly mean, 15.8, at North Powder; maximum, 60, at Pendleton, 29th; minimum, —24, at Jordan Valley, 7th.

Precipitation.—The average precipitation was 1.75 above the normal. It was greatly in excess in western Oregon, and slightly deficient in the eastern portion of the state; greatest, 21.86, at Gardiner; least, 1.13, at Heppner. The snowfall was unusually heavy—over six feet falling in Columbia county. Generally in western Oregon, save on the coast, from one to six feet fell.

Wind.—Prevailing direction, southwest.—*Hon. H. E. Hayes, Master State Grange, Owego, director; B. S. Pague, Sergeant, Signal Corps, assistant.*

PENNSYLVANIA.

Temperature.—The mean temperature for the state was about 11 above the normal, which makes this the warmest January since 1880; greatest local monthly range, 67, at Blue Knob; least local monthly range, 46, at Annville, Catawissa, and Myerstown; greatest daily range, 44, at Chambersburgh, 12th; least daily range, 2, at Tipton, 7th; maximum, 77, at Coatsville, 12th; minimum, —2, at Blue Knob, 22d.

Precipitation.—The average was about 0.30 below the normal. The western part of the state received an excess, and the eastern portion a deficiency; greatest monthly, 6.87, at Clarion; least monthly, 1.47, at Bloomfield.

Wind.—Prevailing directions, west and northwest.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant.*

SOUTH CAROLINA.

Temperature.—Highest monthly mean, 59.4, at Charleston; lowest monthly mean, 49.7, at Spartanburgh; maximum, 81, at Conway, 8th; minimum, 17, at Spartanburgh, 18th; greatest local monthly range, 62, at Spartanburgh; least local monthly range, 38, at Port Royal.

Precipitation.—Greatest monthly, 2.75, at Walhalla; least monthly, 0.28, at Port Royal.—*Hon. A. P. Butler, Columbia, director; J. W. Cronk, Private, Signal Corps, assistant.*

TENNESSEE.

The month was in many respects rather a phenomenal one. The high temperature during the first half, the mild weather during almost the entire month, the abnormal rainfall, the prevailing high winds, and the large percentage of cloudiness, all combined to render it a remarkable and very disagreeable month.

Temperature.—The mean temperature was 13 above the average for the past seven years; highest monthly mean, 53.4, at Cog Hill; lowest monthly mean, 46.1, at Rugby; maximum, 79, at Woodstock, 11th, and at Memphis, 12th; minimum, 16, at Rugby, 7th; this was the highest January minimum during the past seven years.

Precipitation.—Greatest monthly, 10.70, at Bolivar; least monthly, 2.90, at Greeneville.

Wind.—Prevailing direction, south.—*J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.*

TEXAS.

Temperature.—The abnormally high temperature of the two preceding months continued during January; a cold wave passed over the state during the 16th. The average temperature was considerably above the normal; the greatest departure was near the coast, where it was 12; from the coast it gradually decreased northward to the Panhandle, where it was 8. The mean temperature ranged from 38, at Hartley, to 69, at Brownsville; maximum, 84, at College Station, 29th, and at Gallinas, 31st; minimum, 2, at Hartley, 21st.

Precipitation.—The precipitation varied from 2.00 to 10.00 east of the ninety-eighth meridian, which is slightly in excess of the normal; between the ninety-eighth and one hundredth meridians the amount was less than fifty per cent. of the January normal, while west of this it ranged from 0.50 to 1.00, which is slightly in excess of the normal.—*D. D. Bryan, Galveston, director; I. M. Cline, Sergeant, Signal Corps, assistant.*

NOTES AND EXTRACTS.

COMPARISON OF ANEMOMETERS.

[By Assistant Professor C. F. MARVIN.]

In the MONTHLY WEATHER REVIEW for February, 1889, a brief account was given of experiments made upon a large whirling apparatus to determine the proper formula to be used with the Signal Service anemometer in order to accurately compute wind velocity.

With the very satisfactory results thus obtained from the whirling machine experiments as a basis for subsequent comparisons, it has been found that anemometers of different dimensions when exposed to the same wind do not give even approximately the same wind velocity. A brief study of this question was made about a year ago and the conclusion reached that anemometers having cups and arms of relatively considerable weight did not follow closely the sudden fluctuations of ordinary winds, and, in consequence, had a tendency to indicate too high a wind movement. More extended observation, involving the comparison of a much greater variety of anemometers, has shown that this peculiarity is not confined to heavy cups alone, but is exhibited by others as well.

Starting with accurate whirling machine experiments, the results obtained show that of *anemometers exposed to the same wind those whose cups and arms are of slender proportions indicate a higher velocity than that shown by anemometers whose cups and arms are of compact proportions.* The terms slender and compact, in this connection, refer to the relation existing between the diameter of the cups and the length of the arms. Anemometers whose arms from the axis to the centres of the cups are nearly two or more times the diameter of the cups are considered as being of slender proportions, while those whose arms have a length only a little greater or even less than the diameter of the cups are said to be of compact proportions.

While the differences in the velocities indicated by the various anemometers may arise from the circumstance that on the whirling machine the anemometer is in motion while in the open air the air is, itself, in motion, yet such is not believed to be the case, but rather that the result is brought about by the gusty and violently fluctuating character of open air winds.

From a study of many detailed facts derived not only from open air comparisons, but also from whirling machine experiments, it is considered that, of the two classes, the anemometer of compact proportions indicates more nearly the actual wind movement. As the regular Signal Service anemometer is of comparatively slender proportions, it is therefore necessary to change, to some extent, the constants found from the whirling machine experiments, so that the indications of the anemometer in the gusty and fluctuating winds of the open air may be more nearly correct.

Notwithstanding that comparisons have been in progress for several weeks, yet there are so many disturbing elements entering into accurate investigation of this kind and the more or less complete elimination of which is of importance that, being obliged, also, to depend upon the weather for the range of velocities desired, it is found the data is still insufficient in some respects. However, the observations have been reduced and the constants of the Signal Service anemometer computed.

In attempting to compute corrections that may be used to reduce the wind velocities heretofore observed by the Signal Service to more accurate values, one is at once confronted by the most serious difficulties in that the highest velocities at which accurate experiments have been made are far below many of the observed velocities. Owing, moreover, to the very imperfect knowledge of a correct dynamic theory for the Robinson anemometer, the empirical formulæ ordinarily used cannot be depended upon for correct values for velocities beyond the experimental values. This fact is very evident from an inspection of the results given in the table below, which contains values deduced from different formulæ, commonly used by meteorologists in this connection. The formulæ used are as follows, and apply to the Signal Service anemometer having cups 4 inches in diameter on arms 6.72 inches long:

(*a*) $V = 3v$. Robinson formula.
(*b*) $V = .225 + 3.143v - .0362v$ (whirling machine).
(*c*) $V = .263 + 2.953v - .0407v$, (*b*) reduced to open air.
(*d*) $V = .466 + 2.525v$.
(*e*) log. $V = .509 - .9012$, log. v.

V is velocity of wind in miles per hour; v is velocity of centres of cups in miles per hour.

Velocity of wind, in miles per hour, as determined by various formulæ.

(a) Robinson factor.	(b) Quadratic (whirling machine).	(c) Quadratic (open air).	b + c.	(d) Right-line (open air).	(e) Logarithmic (open air).	Corrections.		
						d — a.	e — a.	c — a.
2.5	2.82	2.72	1.04	2.57	2.74	+ .07	+ 0.24	+ 0.22
5.0	5.36	5.07	1.06	4.68	5.12	— .32	+ 0.12	+ 0.07
10.0	10.30	9.65	1.07	8.88	9.56	— 1.12	— 0.44	— 0.35
15.0	15.04	14.01	1.07	13.09	13.77	— 1.91	— 1.23	— 0.99
20.0	19.57	18.14	1.08	17.31	17.85	— 2.69	— 2.15	— 1.86
25.0	23.90	22.05	1.08	21.51	21.82	— 3.49	— 3.18	— 2.95
30.0	28.04	25.72	1.09	25.71	25.72	— 4.29	— 4.28	— 4.28
35.0	*31.97	29.17	1.10	29.93	29.55	— 5.07	— 5.45	— 5.83
40.0	35.70	32.40	1.10	34.14	33.33	— 5.86	— 6.67	— 7.60
50.0	42.56	38.18	1.11	42.56	40.76	— 7.44	— 9.24	—11.82
60.0	48.62	43.04	1.13	50.98	48.03	— 9.02	—11.97	—16.96
70.0	53.87	47.00	1.15	59.39	55.19	—10.61	—14.81	—23.00
90.0	61.97	52.21	1.19	76.23	69.22	—13.77	—20.78	—37.79

*Highest velocity experimentally observed.

The first column gives velocities computed by the long-used "Robinson factor" (3). The next column, b, contains corresponding values computed by a quadratic equation obtained directly from whirling machine experiments. Column c gives the results from this equation when adjusted to open air conditions. The column headed $b \div c$ shows how much the original values from the whirling machine experiments have been changed to adjust to open air conditions. The next two columns contain results by different equations, all purely empirical. The last three columns contain corrections in miles per hour by which wind velocities computed to the Robinson factor can be reduced to those given by the other equations.

No experiments have been made beyond thirty-two miles per hour, and none of the formulæ can be safely depended upon for more than forty miles per hour.

Formula c fits the experiments, so far as they go, far more closely than any other, but its mathematical form is such that values by it at points beyond the experiments are extremely doubtful.

Though formula c does not fit experiments very well, values at high velocities are possibly more nearly correct than by the other formulæ.

As by far the greater majority of wind velocities recorded throughout the United States are below thirty-five miles per hour, it is believed that formula c will give a very close approximation to correct wind velocities, and the last column contains the corrections, in miles per hour, to be applied to past records to reduce the velocities computed by the Robinson factor to the more correct values. If velocities beyond thirty-five miles per hour are corrected at all, it is believed better to use the corrections in the next to the last column. It is not believed advisable to apply corrections to observed velocities higher than forty miles per hour.

Formula c is recommended for the Signal Service anemometer for all velocities up to thirty-five miles per hour.

I have already pointed out a noticeable error in computing mean wind velocities by such a formula as c when the observations embrace a great range of velocities. For example, if the total movement of the anemometer during twenty-four hours be used to reduce a mean hourly velocity the result will, unless the wind velocity has been almost constant, be noticeably different from that obtained by taking the mean of the twenty-four hourly velocity. This arises from the fact that in the twenty-four hour mean the square of the mean velocity of the centres of the cups is used in the formula, while in the case of the mean twenty-four *hourly* velocities the mean of the square of the cup velocities is used. It is scarcely necessary to say that the latter is the more correct.

Much valuable information as to the action of the anemometer, not only at high velocities, but also when subjected to violently fluctuating winds, is yet to be gained from carefully conducted whirling machine experiments, provided they can be carried on under favorable conditions such as obtained in those already made at low velocities.

Meteorological record of Army post surgeons, voluntary, and other co-operating observers, January, 1890.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Alabama.	°	°	°	*Ins.*
Bermuda *†	80	26	59.0	0.15
Butler	76	26	52.0	2.19
Citronelle	84	26	63.1	1.51
Columbiana †	74	25	50.6	4.41
Decatur (1) †	.....	.....	.....	3.38
Decatur (2) †	.....	.....	.....	4.47
Double Springs *	74	22	53.8	5.75
Elkmont †	75	17	50.2	3.60
Evergreen †	.....	.....	.....	1.07
Fayette C. H. †	73	24	52.5	4.60
Gadsden †	76	27	51.0	.....
Greensborough †	76	31	57.0	3.42
Livingston (1)	78	27	57.2	1.67
Mt. Vernon B'ks	81	25	61.6	1.68
Pine Apple †	.....	.....	.....	1.37
Tuscumbia (1)	75	23	51.4	6.33
Valley Head †	72	22	49.6	3.91
Wiggins	81	26	60.9	1.07
Alaska.				
Juneau	38	— 4	17.4	3.22
Arizona.				
Ash Springs	59	26	44.0	2.13
Cooley's Springs †	.....	.....	.....	3.20
Dragoon	.....	.....	.....	2.11
Dos Cabezos	.....	.....	.....	1.28
Fort Apache	69	9	37.9	2.17
Fort Bowie	68	19	45.0	0.78
Fort Grant	73	19	45.4	1.58
Fort Huachuca	62	11	42.1	1.50
Fort Lowell	86	20	49.8	2.09
Fort McDowell	82	24	48.9	0.87
Fort Mojave	74	26	44.0	2.80
Fort Verde	71	17	41.0	1.37
Gila Bend *	68	34	50.6	0.00
Holbrook	66	23	33.7	0.60
Lochiel *	75	12	44.3	3.66
Natural Bridge	.....	.....	.....	4.00
Sachse's Ranch	.....	.....	.....	1.54
San Carlos	78	16	46.5	2.10
Strawberry †	.....	.....	.....	3.35
Teviston	.....	.....	.....	3.80
Tucson (1) †	76	24	47.8	1.27
Walnut Ranch	.....	.....	.....	1.77
Willow Springs	.....	.....	.....	2.98

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Arkansas.	°	°	°	*Ins.*
Arkansas City †	.....	.....	.....	7.12
Camden †	.....	.....	.....	7.57
Conway	77	22	49.8	6.13
Dardanelle	.....	.....	.....	6.49
Forrest City †	78	24	53.4	7.65
Fulton †	.....	.....	.....	7.81
Harrisburgh	75	18	48.0	7.22
Heber	76	19	47.7	5.71
Helena (1) †	.....	.....	.....	10.13
Hot Springs	75	18	51.3	6.39
Huntington	73	28	52.5	4.20
Lead Hill	81	11	45.6	7.37
Little Rock B'ks	77	21	51.5	9.72
Lonoke	76	23	53.7	8.25
Newport (1) †	.....	.....	.....	8.24
Ozone †	69	13	45.2	9.46
Pine Bluff †	76	22	54.7	5.08
Stuttgart †	78	20	50.7	7.64
Texarkana †	80	20	54.7	4.35
Washington †	78	21	56.2	9.21
Winslow *†	66	10	39.9	5.26
California.				
Alcatras Island	56	33	44.5	10.66
Anderson	50	14	38.2	10.56
Angel Island	58	29	44.1	6.95
Benicia Barracks	60	27	42.8	7.35
Berkeley	58	31	43.7	11.16
Centreville *	67	34	48.3	7.18
Colegrove	.....	.....	.....	6.75
Delta	56	— 4	28.3	0.80
Evergreen	.....	.....	.....	6.30
Ferndale *	.....	.....	41.0	22.17
Fort Bidwell	42	—20	18.9	7.45
Fort Gaston	52	27	38.2	18.29
Fort Mason	63	35	45.5	8.20
Georgetown †	50	18	33.6	19.90
Grass Valley	.....	.....	.....	18.01
Hydesville †	53	24	39.4	17.31
Iowa Hill *	50	22	34.9	20.87
Jolon	.....	22	39.4	6.58
Julian †	66	24	41.6	6.12
La Grange *	58	27	42.3	5.17
Lewis Creek	66	26	42.0	5.02
Los Banos *	62	28	44.4	3.11

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
California—Cont'd.	°	°	°	*Ins.*
Los Gatos (2)	.....	.....	.....	16.45
Mendocino	.....	.....	.....	12.41
National City †	69	30	49.8	2.22
Oakland (1) *	57	31	44.4	10.22
Pasadena	68	29	45.7	6.83
Presidio of San F	60	30	46.3	11.06
Riverside *	66	26	43.0	4.28
Sacramento (1)	58	21	38.4	7.44
Salinas (1) *	58*d*	30*f*	45.2	6.19
San Diego B'ks	65	34	51.2	1.98
Santa Barbara (1)	64	34	48.4	5.32
Santa Clara *	62	29	45.6	7.02
Santa Maria	62	29	45.6	7.02
Steeles	58	32	45.7	6.45
Stockton (1)	.....	.....	.....	4.99
Susanville * †	47	— 8	23.9	8.72
Upper Mattole	60	27	43.8	33.40
Vacaville (1) *	59	30	42.8	12.37
Walnut Creek	59	27	44.2	7.77
Willow (1) †	58	26	41.1	3.53
Colorado.				
Agate	62	— 2	29.0	0.40
Apishapa	68	8	27.5	0.20
Arayo	.....	.....	.....	0.08
Aspen	51	—11	19.1	1.90
Bennet	72	—18	35.2	0.70
Breckenridge	64	—26	22.7	1.05
Brush	.....	.....	.....	0.30
Byers	73	1	27.5	0.35
Cañon City	69	— 1	33.4	0.46
Cheyenne Wells	60	0	27.5	0.10
Climax	40	—18	11.4	1.03
Deer Trail	60	—10	23.3	0.30
Delta †	56	— 4	28.0	0.80
Denver (Jes. Col)	70	— 5	27.9	0.13
Durango	.....	.....	.....	1.90
Eagle Farm	.....	.....	.....	0.20
Emma	.....	.....	.....	0.93
First View	70	0	28.5	0.05
Fort Collins	66	—13	24.7	0.13
Fort Crawford	59	— 8	27.6	0.58
Fort Lewis	51	—17	20.4	5.20
Fort Logan	73	— 7	28.6	0.13
Fraser * †	.....	—27	7.2	1.40
Fruita	52	—17	20.8	0.87
Georgetown	51	3	26.2	0.35
Glenwood Springs	55	— 8	24.2	0.89
Greeley	65	1	22.8	0.10
Gunnison	55	—39	4.5	.....
Hardin	.....	.....	.....	0.18
Hugo	70	10	39.3	.....
Husted	65	— 7	28.1	0.09
Idaho Springs	55	— 9	26.5	0.30
Kit Carson	68	0	26.6	0.05
Lamar	75	— 2	33.0	0.20
Las Animas	73	— 4	30.0	0.20
Leadville	45	—10	14.8	0.42
Longmont *g*	63	—13	24.1	0.35
Magnolia	59	— 3	27.4	0.50
Monte Vista	55	—20	18.0	0.00
Mornine	48	3	24.7	0.81
Palmer Lake	58	— 4	28.4	0.20
Parachute	.....	.....	.....	0.84
Ranch near Como	41	—11	15.2	0.34
River Bend	73	2	30.2	.....
Rocky Ford	.....	—10	21.4	0.34
San Luis Ex. Sta	52	—16	21.1	0.10
Sedgwick	.....	.....	.....	0.05
T. S. Ranch	54	— 4	27.8	0.55
Thon	62	— 4	27.4	0.07
Vilas	.....	.....	.....	0.33
Villa Grove	.....	.....	.....	1.30
Watkins	74	3	29.7	0.35
Westcliffe	56	—11	27.3	0.12
Wigwam	.....	.....	.....	0.30
Montesuma Valley	66 *l*	—11 *l*	28.8	1.67
Peyton	.....	.....	.....	T.
Connecticut.				
Birmingham	.....	.....	.....	2.48
Canton	61	6	.....	2.47
Clark's Falls	.....	.....	.....	3.14
Colchester	62	10	34.0	.....
Falls Village	.....	.....	.....	2.53
Fort Trumbull	62	13	37.4	2.63
Hartford (1)	65	11	32.8	3.02
Hartford (2)	.....	.....	.....	2.40
Lebanon	.....	.....	.....	2.99
Mansfield	61	7	32.0	2.66
Meriden	60	8	34.0	.....
Middletown	62	11	33.7	2.84
New Britain	.....	.....	.....	2.25
New Hartford (1) *	54	3	23.6	2.48
Shelton	60	12	34.0	1.26
Southington *	62	12	33.3	2.15
South Manchester	.....	.....	.....	2.55
Thompson	61	9	30.2	.....
Uncasville	.....	.....	.....	3.67
Voluntown *	60	6	35.0	3.14
Wallingford	.....	.....	.....	3.25
Waterbury	61	9	31.8	2.54
West Simsbury	.....	.....	.....	2.38
Delaware.				
Kirkwood *	.....	18	37.9	.....
District of Columbia.				
Washington B'ks	73	15	44.0	0.42

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Florida.	°	°	°	*Ins.*
Altamonte Springs †	87	47	67.0	0.36
Alva †	87	50	66.6	0.24
Archer †	86	37	65.3	0.18
Fort Barrancas	79	36	63.8	0.69
Fort Meade *	81	46	62.4	.....
Lake City †	89	37	65.1	0.08
Madison * †	75	40	62.7	0.59
Manatee †	91	44	68.0	0.73
Matanzas *	79	51	64.8	0.88
Merritt's Island †	81	56	69.6	0.56
Ocala *	81	45	63.4	0.11
St. Francis B'ks	79	43	64.6	0.32
Tallahassee	79	34	60.1	0.78
Villa City † *	83	52	66.9	0.26
Georgia.				
Allapaha	79	38	60.5	0.97
Andersonville h	98	89	63.5	2.90
Athens (1)	72	27	51.4	2.56
Athens (2) †	72	26	51.3	2.52
Camilla *	83	34	62.4	0.39
Diamond *	.....	25	50.7	4.55
Forsyth *	80	30	55.9	2.87
Fort McPherson	75	26	52.0	3.41
Gillsville *	74	30	53.2	2.55
Hephzibah *	74	32	56.2	0.09
Jesup †	.....	.....	.....	T.
Marietta †	73	24	49.9	3.25
Milledgeville * †	77	28	53.5	1.75
Millen	82	26	55.0	0.97
Monticello † *	.....	30	51.1	1.97
Point Peter *	.....	26	50.4	2.45
Quitman (1) *	79	36	60.5	0.42
Woolley's Ford *	72	26	49.0	0.29
Idaho.				
Boisé Barracks	51	—13	21.5	1.70
Era †	40	—22	11.9	6.56
Fort Sherman	45	—19	18.8	4.81
Lewiston	58	— 9	25.3	0.42
Soda Springs †	41	—31	12.4	3.05
Illinois.				
Atwood	66	0	31.9	14.62
Aurora (1) †	60	— 8	27.9	.....
Aurora (2) *	61	— 7	29.6	3.24
Beardstown †	.....	.....	.....	3.75
Beason	63	— 2	32.8	4.35
Belvidere	46	— 8	26.8	2.91
Centralia	70	7	40.0	10.38
Collinsville	70	6	38.7	6.00
Dwight	62	— 8	31.7	4.59
East Peoria	66	0	35.4	3.12
Flora	72	5	39.5	10.06
Fort Sheridan	58	— 7	29.3	2.68
Gibson City *	60	— 4	32.4	6.00
Golconda *	72	16	43.2	7.35
Grand Tower †	.....	.....	.....	9.01
Greenville	73	3	37.4	9.61
Griggsville *	62	— 2	31.8	3.31
Hennepin	63	— 5	25.6	2.05
Irishtown	.....	.....	.....	8.41
Jordans Grove *	74	9	39.5	8.12
Lacon	59	— 3	30.9	2.77
Lake Forest	60	— 7	28.3	2.76
Lanark *	48	—11	23.0	2.76
Louisville	72	4	37.9	8.30
Martinsville	70	7	39.7	6.19
Mascoutah *	74	4	38.4	10.00
McLeansborough	74	8	42.2	7.12
Mount Carmel †	.....	.....	.....	8.77
Olney	70	9	39.5	7.31
Oswego *	56	— 6	28.3	3.44
Ottawa †	59	— 2	32.2	2.59
Pana	70	6	38.7	11.65
Pekin	66	— 4	33.8	3.47
Peoria (1) *†	.....	.....	.....	2.89
Peoria (2)	66	— 2	32.8	2.80
Philo	67	— 4	35.1	6.35
Pontiac	64	— 4	32.0	4.18
Riley	53	—10	25.6	2.65
Rockford	56	—10	26.3	2.81
Rock Island Ars'l	57	— 7	28.8	3.06
Rushville	63	— 2	30.5	2.99
Sandwich *	56	2	31.6	2.69
South Evanston	.....	.....	.....	1.71
Sycamore *	54	— 8	27.2	1.64
Warsaw †	.....	.....	.....	?0.18
Watseka	64	— 2	33.3	4.79
Wheaton *	58	— 7	26.6	3.85
White Hall *	66	4	35.9	6.70
Winnebago	50	—10	26.3	3.39
Woodstock	52	—13	24.2	3.07
Indiana.				
Angola	64	6	34.9	3.91
Blue Lick	67	11	42.1	7.28
Butlerville *	.....	7	40.7	7.29
Cannelton	70	12	41.4	7.16
Columbia City	63	3	34.0	6.19
Columbus	68	10	40.1	7.51
Connersville	68	4	40.0	5.97
Dana	65	3	34.9	2.80
De Gonia Springs	70	16	43.7	5.82
Delphi	63	— 1	33.6	5.59
Evansville †	.....	.....	.....	6.01
Farmland	68	4	39.2	6.57
Franklin	70	7	38.5	8.09
Huntingburgh	70	18	44.2	11.90

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Indiana—Cont'd.	°	°	°	*Ins.*
Huntington †	.....	.....	.....	4.57
Jeffersonville	70	14	44.3	6.04
La Fayette	70	— 3	35.5	4.59
Logansport	68	1	33.5	5.09
Marengo	69	18	45.7	9.70
Marion	66	1	36.1	4.10
Mauzy	65	1	36.0	8.05
Mount Vernon(1)†	.....	.....	.....	6.54
Mount Vernon(2)	71	13	42.3	6.54
Muncie	68	8	36.2	.....
New Providence	72	11	40.6	5.00
Point Isabel *	.....	0	34.5	5.83
Princeton	69	10	42.2	7.65
Richmond	68	4	36.3	7.09
Rushville †	.....	.....	.....	8.75
Scalesville	72	14	44.3	7.19
Seymour	69	10	42.8	6.96
Shelbyville	68	13	36.0	7.30
Spiceland	68	5	39.0	9.03
Sunman †	67	9	39.9	6.11
Vevay	70	10	43.9	7.37
Vincennes †	.....	.....	.....	9.44
Worthington	71	4	39.1	10.69
Indian Territory.				
Caddo Creek A	72	10	42.6	.....
Fort Gibson	78	13	43.2	3.95
Fort Reno	80	5	41.0	2.04
Fort Sill	88	10	41.6	1.73
Fort Supply	82	4	34.0	1.80
Guthrie	74	11	40.5	2.18
Healdton	76	28	54.5	1.22
Tulsa †	.....	.....	.....	3.33
Iowa.				
Amana †	50	—18	21.2	2.49
Bancroft	47	—20	12.7	2.05
Belle Plaine *	48	—16	19.9	2.05
Blakeville *	49	—18	19.9	3.46
Carroll	48	—20	14.8	1.71
Cedar Rapids †	53	—13	23.8	2.10
Clarinda *	54	—17	20.7	2.15
Clinton	55	—10	26.0	2.35
Cresco	43	—21	14.4	1.90
Des Moines	51	—21	20.5	.....
Eagle Grove *	48	—25	13.8	0.35
Elkader *	44	—26	19.2	2.05
Fayette †	48	—27	16.7	1.69
Fort Madison *	55	— 5	28.9	2.49
Glenwood (1)	61	—20	16.6	.....
Grinnell	49	—13	17.9	0.38
Hampton	44	—21	14.2	1.74
Humboldt *	46	—22	14.5	0.94
Independence *	45	—19	17.4	1.99
Iowa City	52	—10	23.9	2.75
Larrabee *	47	—22	11.2	0.99
Le Claire †	.....	.....	.....	2.20
Logan †	54	—20	19.2	1.09
Manson *	46	—22	15.1	2.69
Maquoketa *	48	— 8	24.8	3.19
McCausland *	52	— 6	27.2	1.68
Monticello *	47	—14	21.7	1.90
Mount Pleasant *†	56	— 6	25.7	1.85
Mount Vernon *	52	—15	22.0	1.30
Oskaloosa (1) *	56	—17	22.8	1.41
Sac City †	42	—22	12.6	1.62
Storm Lake *	44	—21	12.1	1.16
Vinton *	45	—18	18.8	2.24
Washington *	56	— 8	25.8	2.23
Webster City *	45	—20	15.1	1.49
Wesley †	44	—21	13.6	1.15
West Bend * †	43	—20	12.7	1.53
Kansas.				
Allison *	53	—14	18.5	0.54
Cairo *	68	0	27.4	2.75
Cunningham *	69	0	27.5	1.98
Elk Falls †	76	5	35.2	1.92
Emporia	68	— 3	29.4	.....
Englewood *	79	4	32.8	0.96
Ft. Leavenworth (1)	65	— 9	27.3	3.40
Ft. Leavenworth (2)	62	— 8	24.4	2.68
Fort Riley	61	—12	22.2	2.12
Fremont	72	—21	23.3	1.25
Globe *	.....	— 7	34.8	2.60
Gove City	78	— 3	25.9	0.91
Kansas City	67	— 5	29.1	1.70
Kirwin †	.....	.....	.....	0.13
La Harpe *	.....	6	31.2	1.28
Lawrence	63	— 5	27.4	2.50
Lebo	70	— 5	29.8	1.98
Leoti	70	— 8	25.3	.....
Macksville	63	— 7	34.2	1.25
Manhattan (1)†	.....	.....	.....	2.71
Manhattan (2)	62	—19	23.1	3.31
Manhattan (3) *	56	—18	23.1	2.23
Morse *	60	—10	.....	2.00
Oberlin †	.....	.....	.....	0.40
Salina †	54	— 6	23.9	1.76
Sedan *	75	4	34.2	2.60
Tribune †	72	4	27.6	0.20
Wakefield	62	— 8	.....	2.24
Wallace †	.....	.....	.....	0.06
Yates Center *	73	— 1	30.1	2.25
Kentucky.				
Ashland *†	.....	16	41.6	3.51
Bowling Green †	73	16	47.9	7.03
Burnside †	.....	.....	.....	4.92
Catlettsburgh †	.....	.....	.....	3.32
Canton *	70	18	45.2	6.90
Eddyville †	.....	.....	.....	5.81
Falmouth (1)†	.....	.....	.....	6.90
Falmouth (2)†	67	14	41.6	6.80
Frankfort (1)†	.....	.....	.....	6.47
Frankfort (2)	72	15	44.6	6.47
Franklin † *	72	21	46.8	7.91
Greensburgh †	.....	.....	.....	5.69
Louisa †	.....	.....	.....	3.17
Millersburgh *†	67	20	47.9	5.04
Mount Sterling †	66	15	43.0	4.78
Murray	71	15	45.2	8.49
Newport Barracks	71	11	42.2	5.30
Owenton †	64	10	38.5	6.30
Paducah †	.....	.....	.....	6.82
Pellville †	77	19	45.4	7.36
Princeton	74	18	43.4	7.53
Richmond †	72	14	45.7†	1.25
Shelbyville †	69	14	44.0	7.13
South Fork † *	74	20	47.4	5.15
Williamsburgh †	.....	.....	.....	6.88
Louisiana.				
Abbeville *	80	31	65.6	3.55
Alexandria †	.....	.....	.....	8.09
Amite City †	83	24	63.2	1.43
Baton Rouge	80	29	62.3	1.67
Bayou Sara	82	38	.....	.....
Cameron †	85	27	64.9	2.10
Chataignier *	82	30	65.3	2.50
Clinton	79	23	57.5	1.95
Columbia	80	25	58.9	6.30
Convent	88	30	64.9	0.51
Coushatta (1)	.....	.....	.....	8.64
Coushatta (2) †	80	23	57.7	8.38
Crowley	80	28	64.9	2.57
Delhi †	.....	.....	.....	1.89
Donaldsonville	82	27	62.6	1.46
Edgard	80	37	62.0	0.70
Emilie	81	32	64.4	0.45
Farmerville	79	25	56.4	4.45
Girard †	80 *l*	49 *l*	64.0 *l*	5.02
Grand Cane	79	25	57.0	6.38
Grand Coteau	81	28	64.0	2.55
Hammond	82	25	64.1	1.33
Houma †	81	34	64.9	1.06
Jackson Barracks	.....	32	.....	0.33
Jeanerette	85	31	66.0	1.83
Jonesville	80	28	57.4	3.60
La Fayette †	80	29	.....	3.56
Lake Charles	82	25	62.2	3.30
Liberty Hill	81	25	57.7	5.86
Luling	83	31	63.7	1.10
Mandeville	79	27	64.3	1.12
Marksville *†	82	30	62.6	5.32
Maurepas	81	29	63.6	1.60
Melville †	83	27	65.8	2.50
Minden †	76	21	57.2	3.22
Monroe †	76	26	56.0	5.72
New Iberia	84	30	66.3	1.88
Plaquemine	81	25	61.9	1.30
Port Eads	78	48	65.8	1.64
Shell Beach	78	28	61.8	1.60
Sugar Ex. Station	80	32	64.4	1.00
Thibodeaux	.....	.....	.....	0.61
Vidalia	83	28	61.1	3.91
Maine.				
Bar Harbor	56	—12	22.6	3.64
Belfast *	54	— 7	21.0	.....
Calais	54	—18	17.6	3.95
Cornish	57	— 3	21.0	3.45
Fairfield	53	—20	16.0	2.55
Farmington	.....	— 9	15.5	1.32
Fort Preble	.....	.....	.....	2.45
Gardiner	56	— 9	20.5	3.18
Kennebec Arsenal	56	0	16.5	1.95
Kent's Hill	57	—12	17.4	1.85
Lewiston	53	— 9	19.1	3.00
Orono †	58	—23	17.6	3.33
Petit Menan *	50	— 8	24.1	.....
West Jonesport	45	—12	23.6	.....
Maryland.				
Barren Creek Sp'gs†	74	16	45.1	1.51
Cumberland (1)	72	14	40.7	1.46
Cumberland (2)	74	15	43.6	1.48
Fallston	67	19	41.0	1.94
Fort McHenry	70	18	42.0	1.45
Frederick	74	17	43.0	1.15
Gaithersburgh *	.....	16	37.6	.....
Galena † *	.....	20	42.6	1.63
Gambrills *	.....	21	45.3	0.25
Jewell	.....	21	44.4	1.52
Leonardstown	72	19	44.2	1.30
McDonogh	69	11	41.2	0.78
Mt. St. Mary's Col†	65	8	40.6	1.96
Woodstock	71	14	42.2	1.74
Massachusetts.				
Amherst	62	5	31.8	3.34
Amherst Ex Sta (1)	62	4	30.5	2.61
Amherst Ex Sta (2)	62	4	33.2	2.61
Andover	64	5	30.5	.....
Blue Hill (sum't)	62	5	30.5	2.63
Blue Hill (base)	64	8	32.2	.....
Blue Hill (valley)	63	2	31.9	2.53
Boston	.....	.....	.....	2.54

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Massachusetts—Con.	°	°	°	*Ins.*
Brewster	59	15	35.9	2.43
Cambridge (1)	62	6	30.0	1.97
Cambridge (2)	63	7	30.3	2.94
Chestnut Hill	64	5	32.0	2.52
Chicopee	.....	.....	.....	2.84
Clinton	.....	.....	.....	2.00
Cotuit	63	10	34.3	2.28
Deerfield *	60	8	29.8	.....
Dudley	55	9	29.3	1.69
Fall River (1)	60	12	35.5	2.91
Fiskdale	.....	.....	.....	2.17
Fitchburg (1) *	58	7	28.5	3.13
Fitchburg (2)	60	6	28.9	3.24
Fort Warren	52	9	27.5	1.36
Framingham	65	6	32.3	2.54
Gilbertville	58	9	32.1	3.42
Groton (1)	64	6	29.7	2.85
Groton (2)	57	5	27.2	.....
Heath	56	0	27.1	.....
Holyoke	60	9	31.2	2.40
Kendall Green	65	2	31.4	2.56
Lake Cochituate	60	— 3	29.4	2.34
Lawrence	62	3	28.6	2.47
Leicester	58	6	28.9	2.96
Leominster	.....	.....	.....	2.98
Long Plain *	62	6	33.4	3.07
Lowell (1)	62	6	28.5	2.75
Lowell (2)	66	3	28.7	.....
Lowell (3)	65	6	29.0	.....
Ludlow (1)	61	4	31.8	3.40
Ludlow (2)	58	3	30.5	3.17
Lynn	63	8	30.8	2.51
Mansfield	63	— 2	32.4	4.15
Medford	.....	.....	.....	2.51
Middleborough	61	0	32.9	2.77
Milton *	62	10	32.9	2.23
Monson	63	3	30.2	3.34
Mount Nonotuck	.....	.....	.....	3.38
Mystic Lake	.....	.....	.....	2.79
Mystic Station	.....	.....	.....	2.47
Nahant	58	10	31.9	.....
New Bedford (1)	60	10	34.6	2.70
New Bedford (2)	62	7	35.4	2.78
Newburyport (1)	65	5	29.7	2.85
Newburyport (2)	.....	.....	.....	1.45
Northampton	66	8	31.6	2.98
North Billerica	65	6	30.8	2.44
Princeton	58	3	28.2	.....
Randolph	.....	.....	.....	3.00
Roberts' Dam	.....	.....	.....	3.01
Royalston *	62	0	33.0	.....
Salem (2)	.....	.....	.....	2.44
Somerset *	60	9	35.4	2.24
Springfield Armr'y.	61	10	31.1	2.67
Taunton (1)	64	6	34.5	3.09
Taunton (2)	62	6	33.7	3.28
Taunton (3)	62	— 1	34.2	2.89
Wakefield	60	6	34.0	2.50
Waltham	.....	.....	.....	2.30
Wellesley	63	— 2	33.4	2.50
Westborough *	64	5	31.7	2.42
Williamstown	60	2	30.2	3.41
Winchester	.....	.....	.....	2.60
Worcester (1) *	61	6	29.9	3.08
Mexico.				
Guanajuato	75	38	59.7	T.
La Logia	82	41	60.0	1.78
Leon de Aldemas	77	41	56.8	0.04
Punta Banda	.....	.....	.....	1.30
Topo Chico *	79	54	68.9	1.12
Zacatecas	75	31	53.2	0.79
Michigan.				
Adrian	66	11	32.6	5.15
Albion (1)	60	4	32.9	4.53
Albion (2)	.....	.....	.....	3.31
Allegan	.....	.....	.....	3.72
Alma	61	2	28.2	2.55
Ann Arbor	63	2	32.4	3.11
Arbela	.....	.....	.....	2.23
Atlantic *	50	1	12.6	5.90
Ball Mountain	62	2	30.0	3.26
Bangor	60	3	34.0	3.30
Bear Lake	43	0	25.9	3.93
Bell Branch *	58	2	31.3	2.21
Benton Harbor	65	11	36.7	2.84
Bensonia	43	— 1	26.2	4.58
Berlin	63	2	31.5	2.71
Berrien Springs *	58	6	33.4	3.30
Big Rapids	48	— 2	26.9	4.11
Birmingham	62	3	33.1	3.74
Bronson	58	2	30.2	3.25
Buchanan	62	2	32.0	5.21
Calumet	44	— 3	17.0	3.66
Cassopolis	62	4	32.3	3.89
Caldwell	45	— 7	26.2	3.40
Charlevoix	48	— 5	22.6	1.68
Chase	47	—10	25.4	.....
Chelsea	63	3	35.3	3.87
Clinton	64	2	33.0	2.96
Colon	57	6	30.4	4.08
Concord	62	1	32.1	3.43
Crawford	.....	.....	.....	2.17
Crystal Falls	43	—20	13.7	1.55
East Tawas	50	6	28.2	1.90
Eden	61	— 1	31.7	2.33
Evart	47	— 8	22.3	3.06
Fitchburgh	.....	.....	.....	5.44
Flint	62	3	30.3	2.24
Fort Brady	40 0	—15	17.3	3.39
Fort Mackinac	40	1	22.0	2.46
Fort Wayne	66	4	33.4	2.94
Fremont *	49	— 1	27.1	3.35
Gaylord	37	3	20.0	.....
Gladwin	51	1	27.4	3.35
Grand Rapids	61	1	30.9	2.03
Grape	65	2	35.0	2.63
Grayling	48	— 1	24.5	3.22
Gulliver Lake	41	—14	19.7	4.33
Hanover	62	3	30.2	4.32
Harrison †	45	— 4	23.9	.....
Harrisville	51	— 1	25.1	4.30
Hart	54	0	31.8	3.70
Hartford	58	8	33.3	2.80
Hastings	61	1	31.3	3.05
Hayes	59	4	30.3	1.41
Highland Station *	60	1	30.2	3.23
Hillman	42	— 3	24.6	4.13
Hillsdale	61	5	33.1	3.58
Hudson	65	— 3	29.2	6.99
Ionia	60	0	30.6	2.75
Ivan	45	— 6	23.8	4.04
Jeddo	56	3	30.5	2.28
Kalamazoo	62	6	31.2	3.45
Lansing	63	0	31.6	2.71
Lathrop	41	—16	17.5	4.03
Madison	61	3	33.4	3.79
Manchester	.....	.....	.....	1.63
Marshall	62	1	32.0	3.14
May	60	1	29.4	2.31
Mio	50	— 1	24.5	2.19
Montague	49	0	28.3	3.33
Noble	.....	.....	.....	3.41
North Aurelius	.....	.....	.....	4.00
North Marshall	60	3	31.3	4.04
Olivet	58	— 2	30.1	2.38
Otsego	62	1	31.0	2.81
Ovid	61	3	30.4	2.13
Parkville	.....	.....	.....	4.44
Paw Paw	63	7	33.3	3.49
Pontiac	60	6	33.0	3.17
Pulaski *	59	4	31.7	3.17
Rawsonville *	65	4	34.5	2.20
Rome *	62	3	30.1	2.63
Roscommon	45	— 7	23.4	4.27
Saint Ignace	44	— 4	21.8	4.47
Saint John's	53	3	29.4	2.23
Sand Beach	57	9	27.9	2.37
South Albion	61	9	36.5	3.33
Stanton	60	0	30.9	1.84
Stockbridge	.....	.....	.....	3.38
Thornville	63	3	32.9	3.38
Traverse City (2)	44	2	24.2	5.05
Vandalia	58	5	31.1	3.29
Vienna	.....	.....	.....	4.21
Washington	62	3	30.0	2.76
Weldon Creek	50	10	26.8	4.80
West Branch	49	0	24.4	3.77
Williamston	58	4	35.3	3.22
Ypsilanti (1)	60	4	30.8	3.10
Ypsilanti (2)	66	5	33.0	2.70
Minnesota.				
Alexandria †	.....	.....	.....	0.43
Crookston	43	—36	—2.1	0.60
Fergus Falls †	.....	.....	.....	0.20
Fort Ripley †	.....	.....	.....	0.45
Fort Snelling	45	—22	10.9	0.46
L. Winnibegoshish	45	—30	3.1	0.56
Leach Lake	46	—35	3.2	0.63
Le Sueur *	43	—24	9.8	0.85
Mankato	49	—16	12.6	0.93
Minneapolis *	42	—21	9.6	1.04
Montlvideo	43	—26	3.5	0.34
Morris	45	—27	3.8	0.10
Northfield	41	—25	11.0	1.22
Ortonville †	.....	.....	.....	0.40
Owatonna	40	—24	10.2	1.12
Pine River	41	—36	2.0	0.55
Pokegama Falls	45	—38	3.3	0.65
Red Wing	46	—21	14.3	1.36
Redwood Falls †	.....	.....	.....	0.13
Rolling Green	41	—20	9.0	0.70
Saint Charles *†	45	—18	12.4	1.05
Sheldon *	.....	—25	13.4	2.00
Tracy †	.....	.....	.....	0.24
Mississippi.				
Agricultural Col'ge	76	25	53.8	3.62
Batesville †	78	24	53.1	0.15
Booneville *	78	23	52.2	5.78
Brookhaven †	82	24	56.4	1.37
Canton	.....	27	.....	5.68
Columbus †	79	24	55.2	3.69
Edwards †	80	27	58.0	3.84
Fayette	81	22	59.8	4.03
Greenville	79	26	55.8	4.98
Holly Springs (1) *	72	24d	50.6d	7.12
Holly Springs (2) †	.....	.....	.....	5.16
Jackson †	80	26	55.8	2.75
Kosciusko †	82	25	56.2	1.78
Lake †	79	23	57.2	3.27
Lock Leven	81	30	61.1	2.97

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Mississippi—Cont'd.	°	°	°	*Ins.*
Logtown	79	31	64.5	1.64
Louisville†	80	20	55.8	3.75
Macon (1)g	80	31	62.8	2.20
Moss Point	78	32	63.4	0.62
Okalona†	.....	.....	.....	6.10
Palo Alto	79	26	54.6	4.59
Pearlington†	79	31	64.5	1.64
Port Gibson†	82	23	60.0	4.15
Pontotoc	76	25	54.1	4.65
Washington	81	24	61.2	3.54
Water Valley*	79	24	54.5	5.36
Waynesboro' (1)†	78	26	58.2	1.91
Yazoo City†	.....	.....	.....	5.54
Missouri.				
Appleton City	73	1	34.2	4.85
Brunswick	66	3	30.6	2.25
Carthage†	73	5	39.1	6.67
Conception	56	—19	24.3	3.32
Craig	56	—15	24.0	2.43
Excelsior Springs*	65	— 6	27.9	2.21
Fayette†	68	— 1	33.4	2.96
Frankford (1)*	.....	— 1	29.2	2.47
Glasgow	70	— 3	32.3	2.35
Grand Pass	68	— 3	31.0	2.10
Hannibal	52	0	.....	0.85
Harris	54	—11	25.9	1.62
Harrisonville†b	60	1	28.4	2.25
Hermann†	.....	.....	.....	6.31
Ironton*	76	10	42.9	10.50
Jefferson Barracks	75	7	39.5	6.30
Jerome	.....	.....	.....	5.27
Kansas City	67	— 6	29.4	2.19
Kidder	.....	—12	.....	1.86
Lamont*	.....	.....	.....	2.01
Lebanon	65	5	40.0	.....
Liberty	62	— 6	29.0	.....
Louisiana Bridge†	.....	.....	.....	3.37
Marshfield	71	10	42.5	.....
Miami	68	— 6	31.0	2.39
New Frankfort*	62	— 3	31.0	2.81
New Haven*	70	7	37.8	.....
Oak Ridge*	76	14	47.4	1.00
Oregon	65	—16	22.6	3.53
Ozark*	70	6	40.0	4.50
Princeton*	60	—10	27.8	3.25
Saint Charles (1)	.....	.....	.....	9.30
Saint Joseph†	.....	.....	.....	2.85
Sedalia	72	— 3	33.3	3.68
Shelbina	.....	.....	.....	2.60
Steelville	.....	.....	.....	7.00
Warrensburgh*	72	8	39.8	2.57
Warrenton*	66	— 3	30.4	.....
Willow Springs†	.....	5	34.0	.....
Wither's Mill*	75	8	42.2	9.55
Montana.	65	2	.....	2.50
Camp Poplar River	38	—39	—7.5	0.79
Custer	.....	.....	.....	0.05
Fort Assinniboine	45	—38	—4.0	1.05
Fort Custer	45	—32	4.5	0.31
Fort Keogh	45	—38	0.5	0.28
Fort Logan†	48	—40	1.8	0.90
Fort Maginnis	56	—31	11.9	0.88
Fort Missoula	40	—18	13.2	0.73
Fort Shaw	52	—29	10.8	0.30
Galpin†	.....	.....	.....	0.36
Glendive†	44	—36	—0.3	0.80
Kintyre	.....	.....	.....	0.23
Martindale	45	—42	7.3	0.28
Powder River†	48	—35	3.7	0.50
Virginia City	43	—27	12.2	0.87
Nebraska.				
Ansley†	69	—24	15.5	0.40
Ashland	50	—20	.....	0.94
Bingham	57	—18	15.2	0.50
Craig	47	—24	13.7	1.00
Creighton†	56	—27	12.0	0.80
Crete	57	—18	18.0	1.27
Culbertson (1)†	.....	.....	.....	0.28
David City†	60	—23	.....	1.42
De Soto*	49	—19	16.8	1.06
Fairbury	56	—12	.....	0.82
Falls City†	55	—10	27.0	0.25
Fort Niobrara	58	—34	8.0	0.36
Fort Omaha	54	—13	20.3	1.22
Fort Robinson	63	—20	15.7	0.29
Fort Sidney	58	—13	18.0	0.34
Franklin	59	—22	19.4	0.20
Fremont*	51	—19	16.3	1.51
Genoa†	50	—21	14.6	1.31
Grand Island h	.....	.....	15.8	0.55
Grant	.....	—15	.....	.....
Hay Springs	54	—19	11.9	0.61
Howe	50	—19	20.6	2.08
Kennedy †*	62	—16	15.8	0.60
Lexington*	60	—15	18.4	0.74
Marquette (1)	53	—17	22.4	0.98
Minden	56	—18	18.8	1.32
Nebraska City	52	—19	19.3	1.30
North Loup* †	56	—24	13.9	1.25
Oakdale	59	—29	10.9	0.85
Palmer	52	—16	11.9	2.00
Plattsmouth†	.....	.....	.....	1.55
Ravenna	61	—21	16.0	1.83
Saronville	.....	—20	11.8	1.10
Syracuse*	56	—14	20.0	1.09

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Nebraska—Cont'd.	°	°	°	*Ins.*
Tecumseh	52	—18	19.4	1.10
Weeping Water*	54	—23	16.7	1.24
West Hill	54	—11	13.8	0.80
Weston	58	—17	17.3	0.77
West Point	50	—23	.....	1.18
New Hampshire.				
Antrim	.....	.....	.....	3.20
Belmont	.....	.....	.....	4.22
Berlin Falls	57	—17	18.0	.....
Berlin Mills*	57	—12	19.3	4.14
Bristol	.....	.....	.....	3.53
Concord	61	— 7	25.0	2.96
East Canterbury	54	— 2	20.4	2.17
Hanover (1)	58	— 9	23.0	2.48
Hanover (2)	63	— 8	21.6	2.65
Lake Village	.....	.....	.....	3.76
Manchester (2)	60	— 4	26.6	3.65
Mine Falls	.....	.....	.....	2.71
Nashua*	63	— 2	27.1	2.57
Newton	62	2	26.8	2.58
North Conway	61	—10	20.0	3.07
North Sutton*	.....	1	23.0	2.84
Pennichuck Station	.....	.....	.....	2.56
Plymouth	53	— 9	17.2	3.85
Stratford	56	—15	21.4	3.33
Walpole	60	— 5	25.4	3.12
West Milan	60	—21	20.5	4.66
Wier's Bridge	.....	.....	.....	4.07
Wolfborough	.....	.....	.....	3.20
New Jersey.				
Allaire	70	14	40.9	.....
Asbury Park	67	18	41.2	1.05
Belleville	72	.....	.....	2.95
Beverly†	76	17	37.4	1.99
Billingsport L. H*	69	21	40.7	.....
Bridgeton*	70	23	44.0	1.71
Cape May C. H.	78	18	45.3	.....
Egg Harbor City	76	15	42.2	1.59
Freehold	70	15	39.7	2.53
Gillette	65	14	37.6	2.43
Hanover	65	14	37.7	2.38
Highland Park	67	12	38.4	2.59
Hopewell	.....	.....	.....	1.84
Imlaystown*	68	17	41.0	2.08
Jersey City	64	18	41.0	.....
Junction	.....	14	.....	2.32
Lambertville*	69	20	40.4	3.05
Locktown	70	15	37.8	3.20
Madison	67	14	37.1	2.49
Moorestown*	73	18	40.1	1.79
Newark	64	17	38.8	2.54
New Brunswick (1)	66	21	40.5	2.59
New Brunswick (2)	70	15	39.3	2.76
New Brunswick (3)	69	16	39.7	.....
Ocean City*	65	18	43.4	.....
Oceanic	69	20	42.4	2.42
Plainfield	68	16	38.3	3.22
Princeton	65	17	39.1	2.24
Rancocas	70	18	.....	1.62
Readington*	70	18	42.5	.....
South Orange	67	15	37.4	2.91
Tenafly	65	16	37.2	2.85
Trenton*	70	17	43.0	2.62
Union*	65	17	37.4	2.50
Woodbury	72	22	42.7	1.90
New Mexico.				
Chama	.....	—17	16.6	2.25
Fort Bayard	.....	9	.....	1.40
Fort Marcy	60	— 4	30.5	0.37
Fort Selden	79	15	44.2	0.73
Fort Stanton	72	7	39.5	0.35
Fort Union	58	10	33.5	T.
Fort Wingate	64	— 3	32.0	1.44
Gallinas Springs†	75	14	41.8	0.18
Hillsborough†	75	15	41.9	1.64
Las Vegas†	66	4	35.4	.....
Los Lunas†	73	21	37.1	0.05
Roswell	59	11	34.9	0.33
Springer†	.....	.....	.....	0.00
New York.				
Adelphia Academy (Brooklyn)	66	21	41.2	.....
Alfred Centre	60	4	31.8	3.50
Ampersand	55	—10	23.6	3.86
Angelica†	61	4	31.9	3.47
Ardenia*	62	17	36.1	0.99
Boyd's Corners*	62	14	35.8	1.97
Brookfield	63	— 2	28.9	4.95
Canton†	60	—14	20.5	4.46
Constableville*	55	— 7	24.8	7.24
Cooperstown*	62	4	29.9	4.39
David's Island	65	14	37.2	2.72
Eden*	65	10	33.9	8.67
Elmira†	63	10	35.6	1.84
Factoryville†	62	9	33.5	2.25
Fleming*	61	10	30.6	5.34
Fort Columbus	64	16	39.6	2.48
Fort Hamilton	65	12	39.0	2.67
Fort Niagara	65	15	34.4	3.15
Fort Porter	60	10	33.0	3.56
Fort Schuyler	66	15	37.2	2.85
Fort Wadsworth	68	16	40.0	3.43
Geneva	67	10	33.6	3.20
Hess Road Sta†	59	— 2	31.8	3.68
Honeymead Brook*	60	14	32.4	2.11

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
New York—Cont'd.	°	°	°	*Ins.*
Humphrey†	62	3	34.2	5.02
Ilion†	65	5	30.2	6.27
Ithaca	64	8	33.1	2.68
Keene Valley	59	— 9	22.9	4.42
Kendall	66	11	33.0	3.75
Kingston	63	10	33.0	2.10
Lowville	60	— 4	.....	.....
Lyons	67	11	32.6	2.92
Madison Barracks	58	—10	26.4	3.19
Marshland	66	4	33.6	2.86
Middleburgh†	68	8	32.3	2.50
North Hammond †*	56	— 6	22.7	3.27
Number Four†	54	—10	23.3	6.64
Oxford	60	4	29.9	4.20
Palermo†	55	5	29.4	4.11
Palmyra*	60	15	34.9	.....
Pendleton Centre*	54	12	30.5	3.45
Perry City	62	9	31.8	3.24
Peekskill h	66	13	30.8	.....
Plattsburgh	62	—12	19.9	.....
Plattsburgh B'ks	64	—15	22.6	2.78
Potsdam*	54	—14	19.4	2.75
Port Jervis	62	10	31.7	2.00
Quakerstreet	64	3	25.6	2.48
Queensbury*	46	4	26.8	5.28
Rome	64	0	28.7	5.68
Setauket	64	18	38.8	1.87
Sherman	.....	.....	.....	6.43
South Canisteo*	62	5	32.7	3.89
South Kortright*†	.....	9	31.8	2.95
Spencerport	64	10	31.2	3.64
Turin*	54	— 6	23.0	7.15
Utica	63	2	30.3	6.14
Watervleit Arsenal	61	6	30.9	2.25
Wedgewood*	60	3	31.0	2.67
West Point	69	10	33.0	1.96
White Plains*	64	10	38.9	1.22
Willet's Point	67	— 2	39.8	2.56
North Carolina.				
Asheville (1)	.....	.....	.....	1.38
Asheville (2)	71	16	47.2	1.42
Blackman's Mills	79	39	57.2	0.33
Bryson City	.....	.....	.....	2.97
Chapel Hill	77	23	46.0	2.23
Clarkton	85	19	52.4	0.53
Clear Creek*	80	22	52.0	0.60
Currituck Inlet	.....	.....	.....	1.01
Douglas	75	19	45.2	1.60
Franklin*	74	12	48.2	1.00
Highlands	63	11	41.7	4.13
Hot Springs	73	18	49.4	.....
Lenoir*	72	20	46.5	1.10
Mount Airy	74	18	46.7	1.49
Mount Holly†	.....	.....	.....	1.12
Murphy	.....	.....	.....	4.26
New Berne†	78	26	54.7	0.67
Oak Ridge	72m	19	44.8h	1.06
Pittsborough*	78	20	49.7	0.62
Raleigh	80	26	53.0	0.50
Salisbury	73	26	50.3	1.06
Soapstone Mount*	.....	22	39.0	1.80
Washington	79	18	51.0	7.40
Weldon†	75	22	50.4	1.02
Winslow*	79	23	52.6	1.00
North Dakota.				
Davenport	41	—30	1.4	0.43
Fort A. Lincoln	41	—31	—3.1	0.10
Fort Buford	40	—37	—3.8	0.22
Fort Pembina	35	—37	—7.4	0.54
Fort Totten	35	—36	—7.2	0.35
Fort Yates	46	—30	3.5	0.28
Gallatin	32	—40	—9.2	0.09
Napoleon	40	—30	—1.0	0.59
New England City	42	—36	—2.6	0.55
Steele	44	—35	—2.4	0.65
Wahpeton	47	—31	2.7	.....
Ohio.				
Akron	65	7	36.7	3.99
Ashland*	65	4	36.4	4.42
Athens	70	10	41.8	4.59
Bangorville	64	2	36.2	5.74
Bellevue*	66	6	36.0	3.11
Bement*	67	10	36.4	3.23
Caledonia†	.....	.....	.....	5.12
Canton†	66	6	36.8	3.94
Carrollton	62	8	37.0	4.95
Celina	69	8	38.6	5.20
Circleville (1)†	.....	.....	.....	4.76
Circleville (2)	.....	.....	.....	5.11
Clarksville	67	6	39.9	6.49
Cleveland	69	10	38.4	3.36
College Hill	66	9	41.6	7.90
Columbus Barracks	68	7	39.3	5.64
Dayton	68	6	40.5	4.83
Demos	70	8	40.0	5.93
Elyria	68	9	36.4	4.07
Findlay	67	4	36.5	4.22
Fostoria	68	5	36.8	3.00
Garrettsville	66	2	35.1	4.51
Georgetown	67	11	41.6	6.52
Granville	66	6	37.3	4.62
Gratiot*	66	7	39.0	5.12
Greenville	62	5	37.1	5.78
Hanging Rock	75	15	43.1	3.86
Hassan	64	2	32.4	2.40

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Ohio—Cont'd.	°	°	°	*Ins.*
Hiram	65	4	34.6	4.43
Hudson	.....	.....	.....	4.47
Jacksonborough	64	4	38.5	5.40
Jefferson	65	7	34.9	4.42
Kent	66	6	41.0	4.59
Kenton*†	70	7	38.1	4.74
Logan	69	9	41.0	5.69
Lordstown	66	7	36.4	3.73
Mansfield†	.....	.....	.....	5.00
Marietta (1)	.....	.....	.....	4.74
Marietta (2)	69	11	42.6	4.96
McConnelsville	70	9	41.4	5.44
Napoleon†	66	6	38.3	5.37
New Alexandria	64	6	39.4	5.04
New Comerstown	66	7	38.4	5.50
North Lewisburgh	66	5	38.0	5.20
Oberlin	66	6	36.6	3.51
O. S. University	68	8	38.8	5.50
Orangeville*	62	12	33.4	4.30
Ottawa	.....	.....	.....	4.24
Poland*	.....	10	35.7	4.30
Pomeroy	69	12	44.1	3.30
Portsmouth (1)†	.....	.....	.....	5.61
Portsmouth (2)	72	17	44.8	5.62
Salineville*	56	17	36.2	4.73
Sidney†	64	5	38.0	4.89
Springborough	.....	.....	.....	6.15
Tiffin	66	8	37.6	3.73
Upper Sandusky	66	7	38.2	3.90
Vienna*	62	5	34.5	2.60
Wapakoneta	66	3	37.6	3.77
Wauseon	66	1	33.4	4.14
Waverly	70	16	44.0	4.76
Waynesville	.....	.....	.....	6.47
Westerville	65	8	37.3	6.31
West Milton*	65	6	40.3	8.23
Weymouth	.....	.....	.....	3.92
Wooster†	66	4	36.0	4.71
Yellow Springs	66	3	38.9	6.17
Youngstown	65	9	38.6	4.11
Zanesville†	.....	.....	.....	4.97
Oregon.				
East Portland	50	8	.....	6.34
Eola	51	4	31.0	7.63
Heppner	56	— 9	23.3	1.13
Jordan Valley	42	—24	15.9	2.01
Joseph	44	— 7	16.0	1.41
McMinnville	50	2	30.8	14.21
Pennsylvania.				
Allegheny Arsenal	71	10	39.7	4.21
Altoona	69	14	42.6	2.17
Annville	64	18	39.4	.....
Aqueduct*	71	17	38.7	2.26
Bethlehem	67	17	39.7	2.29
Blooming Grove*	60	10	35.1	2.20
Blue Knob*	65	— 2	34.1	2.09
Brookville†	.....	.....	.....	2.56
Cannonsburgh	69	8	39.6	5.01
Carlisle	68	15	38.0	2.16
Catawissa	64	18	38.0	2.06
Centre Valley	74	17	39.4	2.45
Chambersburgh	73	11	39.3	1.80
Charlesville	73	8	41.5	1.52
Clarion (1)†	.....	.....	.....	5.72
Clarion (2)	66	6	36.5	6.87
Coatesville	77	16	38.6	2.67
Confluence†	.....	.....	.....	4.63
Coopersburgh	70	16	37.8	2.88
Corry	62	6	34.8	5.07
Drifton	63	9	34.2	1.94
Doylestown	.....	.....	.....	1.55
Dyberry	62	2	31.6	2.74
Eagle's Mere	57	5	31.0	4.57
Easton	.....	17	.....	1.99
Edinbourgh	59	8	33.1	.....
Emporium	62	9	36.4	3.80
F'ks of Neshaminy	.....	.....	38.9	2.40
Franklin*	58	8	34.4	4.50
Frankford Arsenal	64	18	41.8	1.45
Frederick	.....	.....	.....	2.68
Freeport†	.....	.....	.....	4.89
Germantown	70	20	39.8	2.18
Gettysburgh†	75	10	39.1	2.25
Girardville	64	14	36.4	2.94
Grampian Hills	60	6	34.7	4.41
Greensborough†	.....	.....	.....	5.10
Greenville	66	6	35.0	4.58
Hollidaysburgh	71	8	38.7	3.04
Honesdale	62	9	33.0	2.29
Huntingdon	72	12	38.4	3.00
Johnstown	72	10	41.3	4.95
Kennett Square	59	17	36.7	2.37
Lancaster	58	15	35.7	2.03
Lansdale	.....	.....	.....	2.29
Le Roy	59	7	33.0	2.01
Lewisburgh	65	15	37.0	1.92
Lewistown	66	13	38.2	2.49
Lock Haven	66	12	36.3	3.14
Lock No. 4†	.....	.....	.....	5.57
Lynnport	66	13	35.9	2.30
Mahoning†	.....	.....	.....	4.03
Mauch Chunk	64	12	35.7	2.86
McConnellsburgh	74	13	40.5	2.09
Meshoppen	.....	12	32.6	1.06
Myerstown	66	20	36.4	2.59

Meterological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Pennsylvania—Con.	°	°	°	*Ins.*
New Bloomfield	67	10	37.4	1.47
New Castle	68	8	39.3	4.54
Nisbet *	.....	16	35.6	3.90
Oil City†	.....	.....	.....	1.60
Ottsville	.....	.....	.....	2.70
Parker's Landing†	.....	.....	.....	4.96
Petersburgh	70	8	38.2	2.65
Philadelphia	.....	19	40.8	.....
Philipsburgh †	65	5	36.0	2.65
Pleasant Mount	.....	7	30.1	4.70
Point Pleasant	.....	.....	.....	2.44
Pottstown	67	19	39.9	2.35
Quakertown	70	14	37.3	3.19
Reading†	66	15	38.6	3.18
Rimersburgh	61	6	35.0	.....
Salem Corners	58	8	32.6	3.21
Saltsburgh †	.....	.....	.....	4.98
Seisholtzville	.....	.....	.....	2.94
Selin's Grove	66	14	37.0	1.02
Smith's Corners	.....	.....	.....	2.93
Somerset	65	3	38.0	5.60
South Easton	64	11	35.2	1.60
State College	65	7	36.6	2.78
Swarthmore	67	18	40.7	1.87
Tionesta	72	10	35.8	6.00
Tipton *	71	8	37.0	3.51
Troy *	64	13	35.4	1.07
Tuscarora	70	18	39.1	2.02
Uniontown	72	10	43.2	6.10
Warren †	.....	.....	.....	4.34
Waynesburgh	70	9	41.8	3.72
Wellsborough *	63	10	35.8	1.96
West Chester	72	16	39.6	2.60
Westtown	68	18	40.8	0.37
Wilkes Barre	65	12	37.5	1.97
Wysox	64	9	35.3	1.99
York	66	13	39.9	1.84
Rhode Island.				
Bristol	58	12	36.2	2.43
Fort Adams	69	10	35.5	1.68
Kingston (1)	63	8	36.2	3.02
Kingston (2)	61	9	34.0	4.99
Lonsdale	.....	.....	.....	2.71
Newport	58	15	37.4	.....
Olneyville	69	12	36.6	.....
Pawtucket	.....	.....	.....	3.01
Providence (1)	64	12	34.8	2.79
Providence (2)	63	8	33.5	2.93
Woonsocket	61	7	32.4	3.17
South Carolina.				
Aiken	76	28	55.3	1.08
Belmont	76	28	52.0	1.57
Brewer Mine	80	26	52.5	1.36
Cheraw †	80	24	55.2	1.27
Columbia station	81	26	52.8	1.32
Conway	81	30	56.7	0.96
Florence†	.....	.....	.....	0.93
Greenville †	.....	.....	.....	1.91
Greenwood †	74	20	50.4	1.10
Hardeeville	80	27	59.0	0.33
Jacksonborough	.....	.....	.....	0.70
Kirkwood *	.....	24	50.2	0.86
Port Royal*†	74	36	56.8	0.36
Spartanburgh (1)	79	17	49.4	1.16
Spartanburgh (2) †	76	26	54.2	1.10
Trial	79	27	53.0	1.18
Walhalla	71	22	51.4	2.75
Winnsborough	76	26	54.4	1.30
Yorkville	78	24	52.4	1.66
South Dakota.				
Alexandria	45	—24	6.9	0.55
Brookings	43	—28	5.0	0.65
Canton	53	—24	13.8	1.65
Clark	44	—28	3.8	T.
De Smet *	.....	—25	2.8	0.45
Flandreau	.....	—24	.....	0.25
Fort Bennett	46	—25	4.5	0.05
Fort Meade	54	—26	11.6	0.55
Fort Randall	58	—24	13.8	0.60
Fort Sully	48	—24	6.8	0.14
Kimball	45	—24	3.5	0.60
Milbank	.....	—31	.....	0.60
Onida *	40	—20	1.2	.....
Parkston	52	—26	9.2	1.00
Scranton	40	—23	3.7	0.35
Spearfish *	55	—20	14.8	2.10
Vermillion	55	—24	11.2	0.67
Webster	50	—30	5.8	2.04
Wolsey *	44	—29	4.1	0.50
Woonsocket	44	—26	3.8	0.80
Tennessee.				
Andersonville	76	21	48.4	3.21
Arlington †	.....	.....	.....	9.20
Ashwood * †	71	24	49.8	7.89
Austin †	76	21	50.2	8.65
Bolivar (1) †	75	25	51.0	10.70
Carthage †	.....	.....	.....	7.62
Charleston †.	.....	.....	.....	4.55
Clarksville	73	19	47.4	6.75
Clinton †	.....	.....	.....	4.07
Cog Hill	75	27	53.4	6.60
Columbia †	.....	.....	.....	7.32
Covington (1)	75	24	49.4	8.58
Cumberland Gap	69	22	48.0	4.09
Dunlap	68	24	50.2	3.87

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean.	Precip'n.
Tennessee—Cont'd.	°	°	°	*Ins.*
Dyersburgh † ‡	74	22	47.0	7.07
Fayetteville	73	26	52.6	5.79
Florence Station	74	22	48.6	3.35
Grand Junction †	.....	.....	.....	9.00
Greeneville	72	22	47.7	2.90
Grief	73	23	48.2	3.69
Hohenwald	76	20	49.4	8.89
Jacksborough	72	20	48.3	3.27
Johnsonville †	.....	.....	.....	8.36
Kingston (1)	.....	.....	.....	5.95
Kingston Springs	72	21	50.7	7.70
Lawrenceburgh	64	21	41.3	5.98
Lewisburgh	73	23	50.0	5.11
Loudon †	.....	.....	.....	4.31
Lynnville	72	20	48.6	7.76
McKensie	70	25	48.9	5.00
Milan (1)	74	21	47.9	9.11
Nunnelly	76	20	49.7	7.34
Parksville	72	24	50.8	4.26
Riddleton	76	20	49.8	7.94
Rockwood †	.....	.....	.....	5.95
Rogersville	70	20	45.9	2.91
Rugby	66	16	40.1	4.78
Savannah	75	24	52.6	8.20
Springdale	78	20	49.0	3.15
Strawberry Plains †	.....	.....	.....	4.10
Trenton	72	22	47.3	7.70
Watkins	77	18	51.0	7.64
Waynesborough	73	24	50.5	6.20
Woodstock	79	24	50.5	5.70
Texas.				
Austin (1)	80	26	58.0	2.44
Austin (2) *	80	28	56.5	.....
Brazoria †	79	31	63.4	5.58
Caddo Peak	80	18	51.4	0.25
Camp Eagle Pass	85	17	58.5	0.26
C'p Peña Colorado	81	11	51.6	T.
College Station	84	26	57.3	6.94
Colorado	84	15	50.9	0.14
Columbia station	80	30	64.9	7.90
Dallas (1)	77	20	52.3	2.25
Dallas (2)	80	19	49.9	2.89
Decatur †	83	15	49.4	0.81
Duval	36	25	58.7	1.67
Edinburgh †	.....	.....	.....	0.90
Epworth †	75	25	46.2	1.17
Forestburgh *	.....	20	48.2	1.32
Fort Bliss	78	15	47.6	0.81
Fort Brown	83	35	69.5	0.91
Fort Clark	80	28	60.1	0.16
Fort Davis	79	19	51.0	T.
Fort Elliott	83	22	40.6	2.38
Fort Hancock	83	8	42.4	0.78
Fort McIntosh	84	28	62.3	0.90
Fort Ringgold	97	29	65.9	0.78
Fort Worth	78	28	52.1	1.16
Fredericksburgh	78	31	54.9	1.24
Gallinas †	84	32	59.3	0.73
Graham †	84	11	48.8	0.46
Hartley	80	2	39.8	0.50
Hearne †	74	23	56.6	2.00
Houston †	80	27	62.7	5.48
Howe	74	14	48.8	1.80
Huntsville †	78	26	59.4	10.46
La Grange	.....	35	62.2	5.60
Lampassas	82	20	54.3	1.29
Longview †	80	22	57.7	5.59
Merkel	.....	19	45.6	0.30
Mesquite	79	18	49.6	1.39
Miami †	.....	.....	.....	0.22
New Braunfels	78	26	58.4	0.70
New Ulm	81	26	60.0	4.21
Panhandle †	78	11	39.7	1.36
Panter	82	20	52.5	0.70
San Antonio	81	23	60.7	1.74
Silver Falls	83	11	46.6	0.79
Tyler †	76	18	50.8	0.00
Waco (2) †	79	20	56.0	2.25
Utah.				
Alta	.....	.....	.....	0.50
Beaver †	57	—12	26.0	1.03
Bingham †	.....	.....	.....	0.29
Fort Douglas	47	4	29.1	3.07
Fort DuChesne	44	—23	11.5	1.01
Levan	.....	—10	20.2	2.20
Loseet †	50	12	22.2	1.10
Moab	59	— 4	30.7	0.58
Mount Carmel *	.....	—12	23.2	2.25
Nephi †	54	—23	20.1	1.54
Ogden (1) *	54	5	27.4	2.09
Park City	.....	.....	.....	0.00
Price †	.....	.....	.....	0.08
Provo City	.....	.....	.....	1.04
Saint George †	67	14	37.1	2.97
Stockton	.....	.....	.....	0.00
Vermont.				
Brattleborough (1).	61	0	28.6	3.10
Brattleborough (2).	62	5	29.1	.....
Burlington	59	—12	25.0	2.05
Chelsea *	54	— 7	22.1	3.80
Cornwall	.....	.....	.....	3.13
East Berkshire †	58	—18	17.2	4.29
Hartland	63	— 4	25.6	1.95
Jacksonville	55	— 5	25.7	4.31
Lunenburgh *	52	— 8	21.9	3.20

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
Vermont—Cont'd.	°	°	°	*Ins.*
Strafford *	54	— 6	22.3	3.70
Vernon	60	6	28.4	3.31
Weathersfield C'tre	59	— 3	24.8	.....
Virginia.				
Abingdon	.....	.....	.....	2.63
Birdsnest *	76	26	49.6	1.02
Bolar *	66	11	37.7	0.70
Christiansburgh †	71	18	43.1	1.00
Dale Enterprise †	75	17	48.1	0.57
Fort Monroe	71	24	49.6	0.77
Fort Myer	76	16	43.1	1.19
Lexington †	76	16	45.0	1.01
Liberty	.....	25	44.6	1.49
Marion	69	15	43.9	2.36
Middletown † *	76	10	45.2	1.08
Mossingford †	.....	23	45.4	1.37
Nottaway C. H.	78	16	47.1	1.45
Petersburgh †	73	21	46.6	1.07
Richmond †	78	18	48.5	1.31
Salem	72	25	47.0	0.92
Smithfield *	76	27	49.9	0.87
Spottsville *	74	22	48.0	0.90
Staunton	63	18	41.6	0.74
Summit	72	12	41.6	.....
Woodstock †	.....	.....	.....	0.52
Washington.				
Blakeley †	50	10	33.2	7.71
Doe Bay §	48	22	.....	1.13
Fort Canby	50	22	38.6	8.06
Fort Spokane	42	—22	15.1	4.20
Fort Townsend	45	10	31.9	4.65
Fort Walla Walla	48	—13	18.4	2.14
Vancouver B'ks	49	3	29.7	12.55
West Indies.				
Grand Turk Island.	84	78	79.4	3.87
Hamilton, Bermuda	72	50	64.1	1.65
West Virginia.				
Buckhannon †	.....	.....	.....	5.26
Charleston †	.....	.....	.....	3.82
Ella *	64	11	40.4	5.48
Glenville	.....	.....	.....	4.35
Harper's Ferry †	.....	.....	.....	0.50
Hinton	.....	.....	.....	0.11
Kingwood *	62	10	36.1	.....
Morgantown †	.....	.....	.....	5.83
Oceana	72	20	45.0	3.94

Stations.	Temperature. (Fahrenheit.) Max.	Min.	Mean	Precip'n.
West Virginia—Con.	°	°	°	*Ins.*
Pleasant Hill *	64	6	38.0	.....
Point Pleasant †	.....	.....	.....	4.01
Rowlesburgh (1) †	.....	.....	.....	4.69
Rowlesburgh (2) *	.....	13	39.9	.....
Seven Pines m	56	15	35.8	0.20
Tannery *	70	8	42.4	.....
Tyler Creek *	78	19	47.9	3.81
Weston †	.....	.....	.....	4.13
Wheeling †	.....	.....	.....	5.05
White Sulp'r Sp'gs	.....	.....	.....	1.85
Wisconsin.				
Butternut *	.....	—28	10.5	1.02
Cadiz *	.....	.....	23.6	.....
Chippewa Falls †	.....	.....	.....	1.38
Delavan	44	—10	25.3	2.49
Embarrass *	43	—30	18.1	3.75
Glasgow	.....	.....	20.6	.....
Grantsburgh †	47	—21	13.4	1.20
Greenwood †	43	—35	14.7	2.66
Haywood	43	—26	12.4	1.01
Honey Creek *	54	— 6	26.0	.....
Lincoln *	.....	—12	23.6	0.99
Madison	47	—14	22.6	1.81
Manitowoc	46	—19	26.4	3.32
Medford †	.....	.....	.....	1.19
Neillsville *	44	—36	13.5	.....
Oshkosh	48	—21	20.3	3.01
Phillips †	.....	.....	.....	1.71
Portage †	.....	.....	.....	2.89
Summit Lake *	54	—32	15.9	2.57
Wauconsta	.....	—20	19.4	1.20
Wauseka *	.....	—39	16.4	.....
Wyoming.				
Camp Pilot Butte	42	—28	10.9	1.38
Camp Sheridan	35	—19	10.0	6.70
Carbon *	43	— 4	19.0	0.58
Carter †	.....	.....	.....	1.80
Fort Bridger	42	—30	10.2	1.13
Fort D. A. Russell	49	—12	19.6	0.40
Fort Laramie	65	.....	.....	0.30
Fort McKinney	51	—22	13.4	0.14
Fort Washakie	45	—25	11.9	1.36
Lander	42	—26	11.0	0.81
Lusk †	56	—16	17.0	0.14
Saratoga *	45	—27	16.6	1.60
Sundance	.....	—20	11.0	0.85

Letters of the alphabet denote the number of days missing from the record, thus: the letter *c* indicates three days missing in a thirty-one day month, etc., etc.

* Extremes of temperature from observed readings.

† Signal Service instruments.

‡ One observation daily at 10.00 a. m.

§ Record for eight days only.

Mean temperature (degrees Fahr.) observed at Canton, N. Y., by Mr. Henry Smith, voluntary observer.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1862	9.0	7.4	23.4	37.4	53.8	64.0	67.2	67.8	61.3	46.9	28.9	21.0	40.7
1863	21.8	13.9	17.3	39.7	57.9	63.8	63.9	69.0	54.1	47.5	38.8	20.7	41.5
1864	22.8	26.3	29.8	50.3	56.6	66.7	71.3	69.7	58.7	46.8	35.8	23.5	46.5
1865	15.5	17.5	34.7	45.0	56.4	70.0	63.6	65.8	62.8	41.5	35.7	27.9	44.7
1866	15.2	22.6	30.9	46.7	51.6	65.9	72.4	62.7	59.4	51.8	38.2	35.5	44.9
1867	13.2	23.6	28.4	43.1	50.6	70.1	70.2	70.1	60.6	50.2	35.0	15.0	44.3
1868	15.0	14.4	34.9	33.7	57.9	66.4	78.2	70.0	61.8	40.2	33.8	20.4	42.2
1869	24.8	22.7	34.9	40.9	52.9	61.6	70.4	67.7	64.0	44.5	33.0	28.2	39.5
1870	25.1	15.0	23.5	45.0	55.3	73.9	74.3	70.8	63.7	50.8	37.0	22.9	46.4
1871	12.9	19.3	35.0	44.8	56.6	65.8	70.3	70.2	55.0	51.5	28.6	19.0	44.1
1872	19.1	15.2	17.4	41.7	55.7	68.9	74.0	73.7	62.5	46.2	35.0	13.1	43.5
1873	14.9	17.6	27.8	40.5	57.8	70.1	74.3	68.8	59.2	47.8	25.6	27.3	44.3
1874	21.1	15.5	28.4	34.4	54.4	65.8	70.4	67.8	64.6	43.2	33.3	18.4	43.4
1875	7.2	6.4	23.5	37.5	54.8	67.0	70.4	69.4	58.5	44.0	27.2	21.4	40.4
1876	23.8	16.8	24.9	38.6	54.6	70.6	73.6	74.0	58.7	44.8	36.2	9.2	43.8
1877	13.2	26.5	26.2	44.0	56.2	68.2	73.1	72.8	62.2	47.6	36.4	28.7	46.2
1878	16.3	21.8	33.6	52.4	57.1	65.4	75.4	72.6	63.7	50.6	34.8	22.2	47.2
1879	16.6	12.2	25.9	39.5	61.7	66.1	71.8	68.0	58.2	59.2	34.3	22.6	44.7
1880	29.3	21.9	28.1	43.2	65.8	69.2	72.2	67.7	62.1	47.9	30.0	19.5	46.5
1881	10.7	18.8	31.5	41.9	62.0	63.2	72.0	70.4	70.4	49.5	36.0	30.5	46.9
1882	18.0	26.0	39.8	42.4	51.9	64.6	69.1	70.6	60.6	52.6	35.8	22.1	45.2
1883	12.8	19.3	20.3	41.6	51.8	69.2	69.5	67.5	57.4	47.8	37.4	21.2	42.9
1884	13.4	23.0	28.6	43.4	52.8	70.2	69.7	70.5	65.4	50.7	36.0	23.4	45.3
1885	17.6	8.0	16.2	39.9	58.4	64.2	72.1	62.8	59.0	48.4	38.4	24.5	42.5
1886	19.4	17.7	27.4	51.6	59.0	64.1	70.0	70.0	61.2	49.6	35.6	19.9	45.5
1887	13.4	22.1	25.4	41.5	65.9	69.1	77.1	67.3	58.4	46.3	35.0	26.3	45.7
1888	16.0	18.6	25.4	41.5	57.8	69.2	69.3	68.7	56.3	42.2	37.4	28.7	44.3
1889	28.3	14.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean	17.3	18.1	26.6	38.6	56.8	66.4	71.5	68.1	60.7	47.6	34.4	22.6	44.2

NOTE.—Observations made with an alcohol thermometer about 7.00 a. m., 2.00, and 9.00 p. m.

Table of miscellaneous meteorological data for January, 1890—Signal Service observations.

Stations and districts.	Elevation above sea-level, feet.	Pressure, in inches. Mean actual.	Pressure, in inches. Mean reduced.	Pressure, in inches. Monthly range.	Temperature of air, in degrees Fahrenheit. Monthly mean.	Departure from normal.	Maximum.	Mean maximum.	Minimum.	Mean minimum.	Greatest daily range.	Least daily range.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal precipitation.	Wind. Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Direction.	Date.	Cloudless days.	Partly cloudy days.	Cloudy days.	Days with rainfall.	Average cloudiness, tenths. 8 a. m.	8 p. m.	Precipitat'n data since opening of station. Length of record, years.	Greatest for month.	Year.	Least for month.	Year.
New England.					31.6	+6.2									2.92	-1.51																
Eastport	53	30.03	30.09	1.59	20.6	+0.6	52	28.4	-18	12.8	43	2	14.3	73.5	3.76	-0.35	9,802	nw.	45	nw.	9	10	5	16	18	5.8	4.9	17	9.01	1886	0.89	1875
Portland	99	30.02	30.13	1.59	23.2	+1.2	62	30.7	-3	15.8	32	3	16.4	75.8	2.89	-0.69	5,958	nw.	36	nw.	22	7	9	15	15	6.6	5.4	19	6.05	1888	0.77	1872
Manchester	247	29.89	30.17	1.51	26.0	......	62	35.0	-1	17.0	47	4	18.5	77.0	3.02	......	4,910	nw.	35	nw.	9	7	14	10	15	6.4	5.0	3	3.76	1888	2.79	1889
Northfield	871	29.17	30.17	1.42	20.5	......	61	30.0	-10	11.0	55	6	14.4	78.6	2.76	......	8,366	s.	54	w.	13	1	11	19	17	7.9	7.1	3	4.99	1888	2.76	1890
Boston	125	30.03	30.17	1.51	32.4	+7.4	66	41.0	8	23.8	34	8	24.0	73.3	†2.52	-1.96	9,593	w.	44	nw.	22	6	10	15	13	5.9	5.6	20	7.60	1878	1.87	1876
Nantucket	14	30.16	30.17	1.59	34.6	......	56	41.7	17	27.5	29	2	33.0	82.6	3.52	......	9,974	w.	48	nw.	9	10	7	14	14	6.4	5.1	4	5.03	1889	2.97	1887
Wood's Holl	22	30.16	30.18	1.50	35.8	......	55	42.0	14	29.6	30	3	30.4	81.6	2.36	-1.17	14,762	nw.	65	nw.	9	8	6	17	13	6.8	4.8	13	5.47	1878	1.69	1880
Vineyard Haven	......	......	......	....	39.5	......	62	49.7	12	29.3	31	9	......	....	2.27	......	......	sw.	....	......	...	12	5	14	13	...	...	4	4.24	1887	2.27	1890
Block Island	26	30.17	30.20	1.43	37.0	+7.0	57	43.5	14	30.6	30	3	32.3	81.6	2.33	-2.99	14,898	nw.	66	nw.	9	5	11	15	16	6.1	4.3	11	8.57	1882	2.12	1888
Narragansett Pier	22	......	......	....	36.0	+9.0	63	45.4	11	26.6	32	9	......	....	3.13	-2.60	......	sw.	....	......	...	10	12	9	11	...	...	8	6.73	1887	3.13	1890
New Haven	107	30.08	30.20	1.34	35.4	+9.4	65	43.3	10	27.4	36	6	28.0	78.8	3.07	-1.19	6,684	sw.	60	nw.	9	6	9	16	17	6.7	5.0	18	7.55	1873	1.54	1876
New London	47	30.13	30.18	1.38	36.6	+8.6	62	43.8	14	29.5	30	5	28.1	73.2	3.31	-1.13	6,650	nw.	36	nw.	9	6	10	15	15	7.1	5.5	20	7.39	1886	1.45	1871
Mid. Atlantic States.					43.6	+10.9									1.72	-2.01																
Albany	85	30.11	30.21	1.19	30.6	+8.6	61	38.1	6	23.1	34	3	24.2	78.3	2.28	-0.58	7,047	s.	36	se.	25	5	8	18	17	6.9	6.7	17	4.45	1878	1.57	1876
New York City	185	30.01	30.22	1.22	40.2	+10.2	67	47.9	15	32.6	29	8	29.5	69.7	2.95	-0.91	9,206	nw.	55	nw.	22	6	10	15	12	5.6	5.5	20	6.15	1882	1.15	1871
Harrisburg	361	29.83	30.25	1.02	38.0	......	67	45.6	15	30.5	30	4	31.8	80.6	2.01	......	6,197	nw.	42	nw.	8	5	10	16	14	7.2	5.7	2	2.86	1889	2.01	1890
Philadelphia	117	30.12	30.25	1.11	41.8	+10.8	72	49.4	19	34.3	32	6	30.2	67.6	1.83	-1.61	8,584	w.	46	w.	9	7	9	15	11	6.6	5.9	20	5.84	1873	1.49	1872
Atlantic City	53	30.19	30.24	1.08	42.1	+11.1	64	48.8	18	35.4	24	5	35.0	78.2	1.27	-2.64	9,746	sw.	46	nw.	9	7	12	12	10	5.8	4.2	16	7.18	1881	1.05	1876
Baltimore	76	30.16	30.25	0.99	44.0	+11.0	73	51.4	20	36.6	26	5	32.6	69.8	1.80	-1.42	4,191	sw.	28	sw.	13	7	11	13	13	7.2	4.7	20	5.38	1882	0.88	1872
Washington City	112	30.14	30.27	0.96	43.8	+11.8	76	51.7	19	35.8	29	5	32.8	71.8	1.54	-1.88	5,528	s.	40	nw.	16	4	16	11	12	7.3	4.4	20	7.09	1882	0.23	1872
Cape Henry	......	......	......	....	51.8	+11.8	77	61.0	27	42.7	28	6	......	....	1.10	-3.52	......	n.	....	......	...	12	14	5	7	...	...	17	8.43	1884	1.10	1890
Lynchburgh	658	29.56	30.28	0.82	47.2	+11.2	77	56.6	23	37.9	33	6	33.0	66.2	1.59	-2.68	3,767	s.	32	nw.	16	8	14	9	11	6.5	4.7	19	9.77	1885	1.04	1876
Norfolk	69	30.24	30.28	0.92	51.2	+11.2	76	59.4	25	43.0	29	5	40.9	73.6	1.13	-2.85	7,221	sw.	42	nw.	16	9	5	17	10	6.1	4.2	20	6.91	1883	1.13	1890
S. Atlantic States.					57.2	+9.5									0.98	-3.44																
Charlotte	808	29.45	30.31	0.71	50.8	+9.8	77	59.5	25	42.0	28	5	38.8	72.7	0.94	-4.78	4,377	sw.	25	sw.	8	10	9	12	7	4.5	4.1	12	8.90	1885	0.94	1890
Hatteras	11	30.29	30.31	0.92	55.7	+11.7	73	61.6	32	49.8	23	4	51.4	86.6	1.29	-5.22	11,748	sw.	44	n.	28	14	11	6	11	4.9	3.4	16	13.90	1883	1.19	1876
Raleigh	375	29.89	30.30	0.78	51.6	......	76	60.5	23	42.6	33	7	40.2	74.7	0.83	......	5,331	sw.	30	nw.	16	7	12	12	10	5.4	4.2	4	6.02	1889	0.83	1890
Southport	......	......	......	....	56.0	+10.0	70	63.1	29	49.0	27	6	......	....	0.89	-2.77	......	*	....	......	...	10	13	8	8	...	...	15	6.90	1878	0.44	1876
Wilmington	52	30.25	30.31	0.80	57.2	+10.2	80	66.5	27	48.0	31	5	48.0	80.9	1.59	-2.29	5,776	ne.	30	sw.	13	6	15	10	10	5.2	3.4	20	7.52	1878	0.52	1876
Charleston	52	30.27	30.32	0.67	59.3	+9.3	78	66.8	36	51.8	26	6	52.0	85.8	1.28	-2.81	5,214	sw.	35	e.	28	12	14	5	8	5.3	3.2	20	7.83	1878	0.63	1876
Columbia	......	......	......	....	54.8	......	78	63.7	27	46.0	28	7	......	....	1.07	......	......	ne.	....	......	...	5	15	11	11	...	...	2	5.18	1889	1.07	1890
Augusta	183	30.15	30.34	0.60	55.6	+8.6	80	65.1	29	46.2	32	7	47.1	84.2	0.80	-3.76	3,048	ne.	26	n.	28	10	12	9	10	4.7	4.0	20	8.69	1881	0.30	1890
Savannah	87	30.23	30.32	0.56	59.8	+8.8	78	68.6	32	51.0	29	4	50.2	81.6	0.44	-3.08	5,302	ne.	32	ne.	28	11	11	9	10	4.3	2.8	20	8.84	1875	0.44	1890
Jacksonville	43	30.26	30.31	0.38	63.4	+7.4	80	72.9	40	53.8	34	5	56.4	90.4	0.63	-2.84	4,902	ne.	29	ne.	28	12	12	7	9	2.9	3.0	19	9.12	1881	0.49	1888
Florida Peninsula.					69.7	+6.2									0.54	-2.49																
Cedar Keys	22	30.27	30.29	0.25	66.0	+10.0	77	72.7	43	59.4	28	6	59.6	87.6	0.01	-3.90	5,522	ne.	36	ne.	28	12	14	5	1	4.3	2.8	11	9.36	1881	0.01	1890
Jupiter	28	30.23	30.26	0.20	72.2	......	80	77.5	58	66.8	21	5	63.0	74.8	2.41	......	7,843	e.	36	ne.	28	8	19	4	10	4.8	2.7	3	9.84	1889	1.50	1888
Key West	22	30.20	30.22	0.15	73.4	+2.4	80	77.2	65	69.6	11	4	67.0	81.9	1.06	-1.08	9,618	e.	36	ne.	29	13	15	3	10	5.0	2.1	20	5.26	1878	0.37	1888
Micco	......	......	......	....	67.1	......	84	75.8	48	58.4	30	6	......	....	T.	......	......	e.	....	......	...	14	6	7	0	...	...	2	10.22	1889	T.	1890
Titusville	44	30.25	30.30	0.26	66.4	......	82	74.7	48	58.0	26	7	60.8	88.5	0.34	......	7,728	se.	46	e.	28	20	7	4	5	1.6	2.1	3	10.52	1889	0.34	1890
Eastern Gulf States.					59.6	+10.4									2.12	-3.41																
Atlanta	1,139	29.10	30.32	0.52	51.0	+8.0	75	59.0	27	42.9	26	4	43.0	80.8	2.95	-3.66	7,313	e.	35	nw.	16	5	16	10	11	5.6	3.4	12	15.82	1883	2.86	1880
Pensacola	56	30.21	30.27	0.36	62.8	+9.8	79	68.7	36	56.9	22	5	58.2	88.5	0.65	-4.53	6,974	se.	32	nw.	16	7	12	12	6	5.1	4.0	11	9.97	1883	0.65	1890
Auburn	......	......	......	....	55.4	......	76	64.1	28	46.6	27	6	......	....	2.64	......	......	*	....	......	...	8	15	8	7	...	...	2	9.12	1889	2.64	1890
Mobile	35	30.24	30.28	0.41	62.0	+12.0	77	69.1	33	54.8	28	2	56.4	88.2	0.60	-4.59	6,500	*	31	n.	13	2	17	12	5	6.0	4.4	20	11.95	1885	0.60	1890
Montgomery	217	30.05	30.29	0.45	57.4	+9.4	78	65.8	29	48.9	28	7	47.9	77.6	2.53	-2.51	4,266	e.	26	e.	28	5	14	12	11	3.3	3.9	18	9.72	1885	1.65	1880
Meridian	358	29.89	30.28	0.59	57.8	......	79	65.7	26	49.8	33	4	49.6	81.5	2.73	......	4,833	s.	26	nw.	15	7	14	10	11	6.2	3.9	1	......	.....	......	....
Vicksburg	222	29.99	30.23	0.68	59.2	+12.2	82	67.4	28	51.0	25	6	49.8	77.0	5.31	-0.21	5,530	se.	30	nw.	12	4	18	9	11	6.3	3.9	19	13.83	1882	1.85	1880
University	......	......	......	....	52.2	......	76	59.8	24	44.5	44	5	......	....	7.26	......	......	s.	....	......	...	3	16	12	16	...	...	3	7.26	1890	2.95	1888
New Orleans	52	30.18	30.24	0.47	65.1	+11.1	82	72.7	36	57.5	25	5	59.6	90.8	0.66	-4.95	7,052	se.	30	se.	1	8	17	6	7	4.6	4.6	20	11.15	1881	0.66	1890
Port Eads	......	......	......	....	65.8	......	78	73.5	48	58.2	25	9	......	....	1.64	......	......	ne.	....	......	...	0	20	11	7	...	...	3	8.83	1882	1.64	1890
Western Gulf States.					55.3	+11.5									4.68	+1.36																
Shreveport	249	29.94	30.19	0.83	56.6	+11.6	78	64.4	26	48.8	32	2	49.8	80.8	5.15	+0.16	6,142	s.	38	s.	1	3	13	15	13	7.2	5.5	19	12.11	1885	2.24	1881
Fort Smith	470	29.67	30.21	0.96	46.4	+13.4	80	55.8	14	36.9	45	3	39.4	80.6	3.97	+2.21	5,315	e.	32	w.	12	9	6	16	12	6.9	5.4	8	5.33	1889	0.79	1887
Little Rock	309	29.88	30.22	0.88	50.0	+10.0	75	57.4	21	42.6	29	5	42.4	78.0	8.48	+4.11	5,701	s.	36	w.	12	6	11	14	13	7.6	4.4	11	8.48	1890	2.07	1881
Corpus Christi	20	30.13	30.15	0.84	64.0	......	80	69.7	32	58.2	22	4	60.0	88.2	3.84	......	9,422	se.	38	n.	15	1	15	15	12	6.3	4.1	3	5.47	1889	1.91	1888
Galveston	44	30.16	30.20	0.67	64.0	+12.0	74	68.5	35	59.6	20	3	61.0	91.8	2.86	-0.96	9,204	se.	46	n.	16	9	15	7	8	6.5	2.3	19	8.15	1882	0.66	1880
Palestine	511	29.65	30.21	0.89	55.6	+12.6	79	64.1	22	47.2	36	2	49.5	82.1	5.76	+2.00	5,981	ne.	32	nw.	12	3	10	18	14	7.6	8.6	8	7.77	1885	0.52	1887
San Antonio	781	29.34	30.17	0.87	59.4	+9.4	81	68.2	25	50.5	33	6	50.3	79.8	1.87	+0.67	6,722	ne.	38	n.	15	4	7	20	16	7.6	6.2	12	5.11	1889	0.21	1887
Rio Grande Valley.					68.4	+11.4									1.14	-0.38																
Brownsville	57	30.08	30.14	0.77	69.3	+12.3	82	76.3	37	62.1	32	8	63.0	88.1	0.69	-1.30	7,421	s.	37	s.	10	14	8	9	7	4.3	3.5	15	3.87	*	0.10	1876
Rio Grande City	230	29.91	30.16	0.98	67.6	+10.6	88	77.2	34	58.1	38	5	59.8	86.8	1.58	+0.54	6,428	se.	34	n.	15	5	20	6	10	5.7	3.9	13	3.48	1881	0.00	1878
Ohio Val. & Tenn.					44.8	+10.9									6.29	+1.68																
Chattanooga	783	29.48	30.33	0.60	50.4	+9.4	75	58.6	25	42.3	31	5	43.3	81.1	4.68	-2.84	5,032	s.	35	sw.	13	3	15	13	12	7.3	5.4	12	14.74	1882	4.48	1880
Knoxville	980	29.25	30.31	0.66	48.8	+10.8	73	56.4	24	41.2	27	4	40.0	77.4	4.26	-1.72	4,793	sw.	36	sw.	13	5	14	12	12	6.1	5.6	20	16.98	1882	2.16	1880
Memphis	349	29.87	30.25	0.86	50.8	+11.8	79	57.8	23	43.8	26	4	43.4	80.6	8.43	+2.73	6,721	s.	36	w.	12	7	10	14	16	6.2	5.0	18	12.87	1882	2.17	1872
Nashville	553	29.68	30.27	0.84	49.0	+12.0	75	56.6	20	41.4	31	4	40.6	78.4	8.10	+2.81	5,645	se.	28	se.	13	2	13	16	16	7.3	6.5	20	14.51	1882	2.32	1872
Lexington	......	29.10	......	0.84	44.0	......	71	50.1	14	37.8	25	4	37.0	79.9	5.34	......	12,622	se.	56	nw.	13	0	14	17	20	7.2	7.2	7	6.06	1876	1.96	1875
Louisville	551	29.64	30.24	1.01	44.8	+10.8	72	52.3	14	37.2	35	4	36.6	74.6	5.73	+1.54	6,408	s.	36	sw.	13	5	9	17	16	7.4	6.9	18	11.63	1876	1.94	1884
Indianapolis	766	29.37	30.21	1.19	37.4	+11.4	70	44.5	4	30.3	24	3	31.4	79.2	10.20	+7.38	5,604	sw.	30	nw.	13	5	12	14	20	7.4	6.0	19	10.20	1890	1.01	1875
Cincinnati	628	29.55	30.24	0.96	41.5	+9.5	71	48.9	10	34.1	30	4	35.8	78.0	5.28	+1.83	6,445	sw.	38	sw.	13	4	7	20	19	7.7	5.8	20	9.49	1876	0.60	1872
Columbus	837	29.30	30.23	0.95	39.1	+11.1	67	46.5	9	31.7	39	3	32.4	78.6	5.73	+2.46	5,659	s.	44	w.	13	6	10	15	18	7.2	5.7	12	5.73	1890	1.66	1879
Pittsburgh	847	29.27	30.21	1.05	41.4	+11.4	71	49.9	11	33.0	39	6	36.8	83.6	4.18	+0.97	4,749	nw.	35	nw.	13	4	4	23	18	8.7	6.9	19	6.17	1888	1.20	1872
Parkersburgh	638	29.55	30.25	0.95	42.4	......	70	50.3	12	34.4	30	1	37.4	84.0	4.30	......	5,717	s.	35	w.	8	9	4	18	17	7.3	6.6	2	4.30	1890	3.03	1889
Lower Lake Region.					34.4	+10.5									3.91	+1.26																
Buffalo	690	29.35	30.11	1.32	32.8	+9.8	65	39.7	10	25.9	37	4	26.9	79.2	3.90	+11.4	11,630	w.	90	sw.	13	1	15	15	22	7.0	7.7	20	5.61	1874	1.16	1871
Oswego	335	29.75	30.13	1.30	29.6	+7.6	64	37.5	0	21.8	42	5	25.6	84.2	4.46	+1.54	10,460	s.	52	w.	13	0	5	26	21	9.3	8.5	20	6.49	1884	0.92	1887
Rochester	621	29.44	30.14	1.36	32.7	+9.7	66	40.2	10	25.2	39	3	26.6	80.3	4.63	+1.72	8,347	sw.	60	w.	13	1	7	23	26	9.0	7.2	20	8.05	1878	0.94	1883
Erie	714	29.36	30.15	1.26	37.6	+11.6	68	46.7	13	28.6	36	4	30.4	80.4	4.50	+0.99	11,836	s.	48	w.	13	3	4	24	22	9.0	7.9	17	6.20	1878	1.41	1875
Cleveland	751	29.35	30.19	1.12	37.0	+13.0	68	44.5	10	29.5	41	3	30.0	76.4	4.03	+1.52	7,795	sw.	47	s.	13	3	8	20	20	8.0	6.2	20	5.16	1874	0.31	1871
Sandusky	629	29.48	30.18	1.11	35.9	+10.9	69	43.5	7	28.3	31	4	30.0	78.8	3.49	+1.34	8,407	sw.	48	sw.	13	2	10	19	18	7.4	5.6	13	3.77	1880	1.01	1883
Toledo	673	29.43	30.18	1.11	36.1	+12.1	71	45.0	5	27.2	49	6	28.8	81.4	3.39	+1.19	8,317	sw.	50	s.	13	6	11	14	17	7.0	6.1	20	3.63	1873	0.54	1881
Detroit	662	29.41	30.15	1.17	33.6	+9.6	66	40.4	5	26.8	33	6	27.8	82.8	2.70	+0.67	8,997	sw.	48	sw.	13	2	12	17	12	7.0	6.1	20	4.96	1874	0.97	1875
Upper Lake Region.					24.8	+8.6									2.77	+0.85																
Alpena	609	29.40	30.09	1.55	24.6	+9.6	51	30.8	2	18.4	27	3	21.4	89.4	3.77	+1.30	7,753	w.	42	w.	13	1	10	20	20	8.3	5.3	18	5.16	1886	0.82	1878
Escanaba	608	......	......	....	19.6	+8.6	42	27.9	-11	11.3	30	6	......	....	2.95	+1.44	......	n.	....	......	...	10	5	16	12	...	...	19	4.80	1886	0.31	1878
Grand Haven	621	29.42	30.12	1.40	30.6	+8.6	61	36.7	5	24.5	28	3	25.2	82.0	2.83	+0.32	9,436	w.	58	sw.	13	2	8	21	19	9.2	7.3	18	4.40	1887	0.55	1873
Lansing	883	29.18	30.17	1.20	31.2	......	63	38.8	1	23.6	31	5	26.8	88.6	2.97	......	6,067	nw.	42	sw.	13	3	10	18	17	7.5	5.3	4	3.88	1887	1.93	1889
Manistee	615	29.41	30.11	1.25	27.3	......	44	31.3	2	23.3	18	1	23.6	85.2	5.64	......	7,423	w.	42	w.	13	5	3	23	17	8.3	7.3	2	5.64	1890	3.05	1889
Marquette	735	29.26	30.08	1.26	18.8	+5.8	46	25.7	-6	11.8	28	5	12.0	75.8	3.11	+1.65	7,648	nw.	54	sw.	24	2	12	17	18	7.1	6.5	19	3.94	1889	0.29	1877
Port Huron	639	29.44	30.15	1.25	32.1	+12.1	64	38.9	4	25.3	36	2	25.6	80.6	3.11	+1.12	10,466	s.	72	sw.	13	4	11	16	16	7.1	6.8	16	3.50	1881	0.84	1879
Sault de Ste. Marie	642	29.34	30.08	1.43	17.6	......	39	23.9	-11	11.2	31	4	14.8	88.6	4.03	......	5,593	se.	25	nw.	8	0	4	27	25	9.3	7.2	2	4.03	1890	2.50	1889
Chicago	715	29.36	30.15	1.40	30.8	+8.8	62	38.0	-5	23.7	29	5	25.6	81.2	2.98	+0.80	7,978	sw.	42	nw.	8	7	13	11	14	6.7	5.5	20	4.13	1871	0.54	1879
Milwaukee	697	29.36	30.14	1.31	26.0	+9.0	47	32.9	-10	19.2	32	3	20.6	83.0	2.51	+0.28	8,384	*	42	w.	8	8	9	14	13	6.7	5.9	20	5.02	1876	0.51	1879
Green Bay	616	29.44	30.14	1.40	19.0	......	43	26.0	-22	11.9	28	1	14.2	84.2	3.29	......	5,363	s.	33	w.	8	6	10	15	11	6.7	6.2	4	3.75	1889	2.38	1888
Duluth	672	29.36	30.14	1.23	12.2	+6.2	44	19.6	-19	4.9	37	4	5.8	77.2	0.87	-0.25	5,501	sw.	31	sw.	31	8	9	14	14	5.2	6.4	20	2.44	1871	0.55	1878
Extreme Northwest.					-2.7	-0.3									0.73	+0.06																
Moorhead	926	29.15	30.25	1.38	-0.9	+4.1	40	8.2	-31	-10.0	51	5	-4.0	86.8	0.26	-0.52	6,403	nw.	42	s.	*	11	8	12	6	4.5	4.5	10	1.34	1882	0.02	1885
Saint Vincent	804	29.26	30.22	1.38	-10.0	0.0	32	-0.8	-38	-19.1	48	2	-17.6	75.4	1.98	+1.54	6,522	n.	30	n.	1	13	9	9	13	3.5	4.5	10	1.98	1890	0.13	1881
Bismarck	1,681	28.29	30.23	1.22	-2.1	-3.1	39	7.0	-35	-11.2	46	5	-8.2	76.8	0.80	+0.15	5,255	nw.	36	w.	8	20	6	5	4	1.9	3.3	16	1.64	1877	T.	1878
Fort Buford	1,900	28.03	30.22	1.22	-4.2	-5.2	42	6.3	-37	-14.6	53	7	-7.8	85.8	0.22	-0.43	4,829	nw.	36	w.	7	11	12	8	6	3.9	5.2	12	1.98	*	0.02	1879

Table of miscellaneous meteorological data for January, 1890—Signal Service observations—Continued.

Stations and districts.	Elevation above sea-level, feet.	Pressure, in inches. Mean actual.	Mean reduced.	Monthly range.	Temperature of air, in degrees Fahrenheit. Monthly mean.	Departure from normal.	Maximum.	Mean maximum.	Minimum.	Mean minimum.	Greatest daily range.	Least daily range.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal precipitation.	Wind. Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Direction.	Date	Cloudless days.	Partly cloudy days.	Cloudy days.	Days with rainfall.	Average cloudiness, tenths. 8 a. m.	8 p. m	Precipitat'n data since opening of station. Length of record, years.	Greatest for month.	Year.	Least for month.	Year.
Ex. northwest-Con.																																
Fort Yates	.....	.....	.....	.....	1.6	+ 2.6	57	13.4	—28	— 6.2	43	6	.....	.....	0.31	— 0.46	.....	nw.	.....	.....	.....	9	16	6	5	.....	...	8	1.23	1888	0.31	1890
Upper Miss. Valley.					27.0	+ 7.3									3.47	+ 1.62																
Saint Paul	831	29.23	30.18	1.35	9.9	+ 1.9	42	17.7	—22	2.1	37	2	4.6	80.4	0.95	— 0.11	3,949	w.	26	nw.	8	6	16	9	9	5.4	5.4	20	4.34	1881	0.11	1879
La Crosse	744	29.36	30.20	1.28	16.8	+ 4.8	48	24.8	—23	8.8	40	4	12.1	83.6	1.57	+ 0.32	4,623	nw.	25	nw.	8	6	17	8	9	6.1	5.5	18	3.44	1866	0.25	1887
Davenport	615	29.51	30.20	1.30	26.6	+ 5.6	54	34.6	— 7	18.6	29	4	19.4	78.6	2.49	+ 0.78	5,377	nw.	48	sw.	11	9	12	10	9	3.8	5.4	19	4.34	1874	0.13	1872
Des Moines	869	29.24	30.20	1.15	20.6	+ 4.6	50	30.3	—18	11.0	43	5	11.9	75.8	2.62	+ 1.36	5,384	nw.	24	nw.	13	17	8	6	8	4.3	4.8	12	3.47	1886	0.63	1882
Dubuque	651	29.44	30.18	1.39	22.2	+ 7.2	52	30.0	—16	14.5	41	3	16.8	83.0	2.31	+ 0.62	3,901	w.	22	w.	8	9	10	12	9	3.0	5.0	17	3.33	1887	0.44	1879
Keokuk	613	29.33	30.23	1.17	29.4	+ 8.4	64	38.3	— 5	20.4	29	7	24.6	85.6	1.81	+ 0.14	5,060	nw.	36	s.	11	13	5	13	11	4.1	4.8	19	3.92	1874	0.07	1872
Cairo	359	29.54	30.25	1.01	44.0	+11.6	73	51.6	17	37.5	27	3	37.6	80.3	6.32	+ 2.35	7,859	s.	47	w.	12	7	3	21	18	7.5	6.7	19	15.05	1876	1.44	1872
Springfield, Ill	644	29.49	30.20	1.23	33.3	+ 8.3	68	41.6	— 2	25.0	27	6	27.3	81.4	5.72	+ 3.65	8,171	s.	44	sw.	13	8	8	15	15	5.3	6.0	11	5.72	1890	0.84	1881
Saint Louis	571	29.60	30.23	1.12	39.2	+10.2	74	47.3	8	31.1	29	9	31.8	77.8	7.47	+ 5.24	8,977	sw.	56	sw.	12	9	8	14	14	6.8	4.5	20	7.47	1890	0.49	1881
Missouri Valley.					15.1	+ 1.4									0.82	+ 0.12																
Columbia	.....	.....	.....	.....	36.2	.....	70	47.9	0	24.6	36	11	.....	.....	4.02	.....	.....	s.	.....	.....	...	5	9	17	10	...	6.9	1	.....	.....	.....	.....
Kansas City	947	29.16	30.23	1.07	30.2	.....	68	39.4	— 5	20.9	39	7	23.2	78.6	1.49	.....	6,235	nw.	36	se.	11	8	11	12	12	5.3	4.1	2	1.49	1890	1.05	1889
Springfield, Mo	1,356	28.72	30.20	0.92	39.4	.....	74	49.2	4	29.4	47	4	32.4	83.2	5.51	.....	8,538	s.	54	w.	12	6	11	14	13	6.2	5.3	5	5.51	1890	1.05	1883
Leavenworth	842	29.29	30.22	1.10	28.1	+ 5.1	67	38.1	— 6	18.1	40	8	21.2	79.7	1.27	— 0.05	3,512	n.	30	sw.	11	10	6	15	10	4.9	4.6	19	3.14	1874	0.13	1872
Topeka	.....	.....	.....	.....	25.8	.....	64	37.0	—10	14.7	43	10	.....	.....	2.54	.....	.....	nw.	.....	.....	...	7	15	9	7	.....	...	3	2.54	1890	0.63	1889
Omaha	1,113	29.00	30.24	1.12	18.3	+ 2.3	52	26.1	—14	10.3	35	5	10.4	74.1	1.44	+ 0.86	6,144	nw.	32	nw.	12	8	12	11	11	4.6	4.5	20	1.62	1889	0.07	1879
Crete	.....	.....	.....	.....	18.9	.....	57	29.7	—18	8.1	33	10	.....	.....	1.00	.....	.....	nw.	.....	.....	...	16	5	10	7	.....	...	3	1.45	1889	0.35	1888
Valentine	2,613	27.34	30.29	1.03	11.0	.....	59	21.4	—24	0.7	41	4	1.8	69.6	0.69	.....	6,626	w.	54	w.	30	7	10	14	8	4.4	3.3	5	1.27	1889	0.04	1888
Sioux City	1,158	28.93	30.27	1.19	14.0	.....	52	22.9	—20	5.2	41	6	8.0	79.0	1.14	.....	6,421	nw.	36	s.	22	10	10	11	7	4.1	4.1	1	.....	.....	.....	.....
Fort Sully	1,600	28.42	30.25	1.11	1.3	.....	46	10.1	—25	— 7.5	41	5	— 4.0	77.8	0.15	— 0.41	5,030	nw.	36	nw.	30	16	10	5	6	3.1	3.1	12	1.03	1887	0.09	*
Huron	1,307	28.74	30.24	1.30	2.6	— 1.4	43	11.6	—28	— 6.3	40	4	3.1	79.2	0.66	+ 0.35	7,001	nw.	38	ne.	22	13	12	6	8	3.3	3.5	9	1.20	1889	0.09	1884
Yankton	1,234	28.82	30.22	1.24	11.4	— 0.6	56	19.7	—22	3.2	44	5	4.7	79.0	0.56	+ 0.02	6,185	nw.	31	s.	24	9	11	11	6	5.0	4.1	17	1.23	1881	0.04	1882
Northern Slope.					10.1	— 5.8									0.46	— 0.61																
Ft. Assiniboine †	2,690	27.11	30.11	1.15	— 5.1	—12.1	46	4.7	—39	—14.9	48	4	— 8.2	75.2	0.46	— 0.68	7,442	sw.	48	sw.	8	10	6	7	7	4.5	5.3	10	2.47	1883	0.16	1884
Fort Custer	3,040	26.83	30.18	1.02	4.8	— 9.2	45	16.0	—32	— 6.5	42	5	0.1	85.8	0.31	— 0.68	4,284	se.	40	n.	30	12	16	3	8	2.4	3.9	11	2.85	1884	0.08	1885
Fort Maginnis	4,340	.....	.....	.....	10.2	— 4.8	49	20.5	—38	0.0	49	2	.....	.....	0.88	— 1.10	.....	nw.	.....	.....	...	13	8	10	8	.....	...	8	2.77	*	0.88	1890
Helena	4,069	25.77	30.15	0.92	7.2	— 7.8	49	14.6	—23	— 0.3	46	6	0.4	76.8	0.61	— 0.96	2,541	sw.	30	w.	30	17	10	4	9	3.1	4.7	10	3.75	1884	0.42	1889
Rapid City	3,280	26.60	30.23	0.85	12.8	.....	56	23.8	—24	1.8	48	5	0.8	68.2	0.47	.....	5,000	ne.	48	w.	25	12	14	5	7	4.5	2.4	5	0.52	1889	0.18	1883
Cheyenne	6,105	23.88	30.06	0.66	24.8	+ 0.8	59	30.6	— 2	13.1	37	6	3.2	49.0	0.16	— 0.12	9,519	w.	58	w.	25	10	16	5	6	1.8	3.4	9	0.88	1883	0.02	*
Fort McKinney †	5,000	24.81	30.14	0.70	15.8	.....	57	27.7	—23	4.0	43	10	4.2	68.6	0.15	.....	5,971	w.	60	sw.	25	21	6	4	6	2.6	3.5	3	0.41	1889	0.15	*
Fort Washakie	5,580	24.34	30.14	0.77	11.2	.....	43	23.8	—22	— 1.3	42	15	2.6	74.2	0.97	.....	3,236	sw.	34	sw.	26	19	5	7	5	2.9	3.8	4	1.02	1888	0.75	1889
North Platte	2,841	27.13	30.23	0.90	18.8	— 0.2	66	30.5	—12	7.1	43	7	7.8	73.0	0.35	— 0.11	5,670	w.	30	nw.	*	13	13	5	7	4.3	4.4	16	2.33	1879	0.00	1878
Middle Slope.					33.2	+ 4.9									1.14	+ 0.67																
Colorado Springs	.....	.....	.....	.....	28.0	.....	73	43.1	— 5	12.8	49	15	.....	.....	0.41	.....	.....	.....	.....	.....	...	17	10	4	2	3.3	2.8	6	0.41	1890	0.06	1874
Denver	5,281	24.66	30.06	0.75	28.2	— 0.8	72	41.3	— 8	15.2	50	15	10.8	58.1	0.18	— 0.43	5,094	s.	48	nw.	24	16	11	4	4	2.5	2.8	19	2.35	1883	0.11	1888
Pueblo	4,753	25.19	30.14	0.83	31.2	.....	70	45.8	— 2	16.7	50	12	13.3	56.1	0.12	.....	6,302	w.	46	w.	30	15	15	1	2	2.7	3.5	2	0.34	1889	0.12	1890
Concordia	1,410	28.68	30.28	1.06	21.0	.....	58	30.1	—14	11.9	34	4	14.4	80.7	1.38	+ 0.80	5,041	s.	30	s.	24	11	14	6	7	3.4	3.3	5	1.42	1889	0.51	1888
Dodge City	2,523	27.46	30.22	0.97	27.2	+ 2.2	72	38.3	— 3	16.0	40	3	18.6	77.6	0.42	+ 0.05	7,389	*	48	s.	16	12	11	8	5	4.5	4.6	10	1.82	1886	0.00	1876
Wichita	1,366	28.69	30.22	1.13	30.0	.....	70	39.8	0	20.3	44	5	23.4	82.5	2.12	.....	6,799	n.	30	n.	20	11	11	9	9	3.6	4.1	2	2.12	1890	0.82	1889
Fort Reno	.....	.....	.....	.....	41.2	+12.2	78	50.3	10	26.2	47	11	.....	.....	1.82	+ 1.51	.....	n.	.....	.....	...	21	3	7	5	.....	...	8	2.59	1889	0.00	1883
Fort Supply	.....	.....	.....	.....	36.1	+ 6.1	81	48.7	5	23.5	41	5	.....	.....	1.89	+ 1.44	.....	s.	.....	.....	...	8	10	13	5	.....	...	9	1.89	1890	0.04	1887
Fort Elliott	2,690	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	...	11	1.63	1889	T.	*
Southern Slope.					44.3	+ 7.3									0.76	+ 0.20																
Fort Sill	1,200	28.88	30.17	0.92	39.8	+ 4.8	70	49.9	12	29.6	37	3	30.5	79.0	1.58	+ 0.71	6,269	n.	44	n.	10	5	6	7	7	5.1	5.8	13	2.73	1879	0.00	1887
Abilene	1,748	28.32	30.17	0.79	49.8	+ 9.8	83	59.9	17	39.6	32	3	37.4	70.0	0.33	+ 0.02	9,304	s.	48	sw.	10	8	11	12	5	6.1	4.3	5	2.74	1889	0.06	1887
Fort Stanton	6,150	23.98	30.01	0.54	35.4	.....	69	52.3	8	24.5	45	7	24.2	66.0	0.37	— 0.13	6,039	sw.	44	sw.	10	12	15	4	4	2.9	4.1	7	1.33	1889	0.01	1887
Southern Plateau.					42.5	+ 1.1									1.29	+ 0.53																
El Paso	3,796	26.26	30.08	0.50	48.3	+ 4.3	77	61.3	20	35.3	38	7	24.0	45.2	0.72	+ 0.22	4,603	nw.	38	w.	10	21	6	4	5	2.1	3.2	12	1.57	1879	0.03	1887
Lava	.....	.....	.....	.....	41.3	.....	72	55.1	11	27.5	43	9	.....	.....	0.80	+ 0.69	.....	s.	.....	.....	...	15	6	10	3	.....	...	6	1.60	1889	T.	1887
Santa Fé	7,026	23.26	30.15	0.60	32.2	+ 5.2	58	41.8	2	22.5	32	3	12.5	52.3	0.42	— 0.07	5,073	ne.	30	n.	19	8	14	9	8	3.9	4.6	18	1.39	1874	0.10	1887
Fort Apache	5,000	.....	.....	.....	38.4	+ 3.4	71	51.9	8	24.8	47	9	.....	.....	2.26	+ 0.84	.....	sw.	.....	.....	...	17	3	11	5	.....	...	12	3.90	1886	0.20	1881
Fort Bowie	.....	.....	.....	.....	44.8	+ 2.8	68	53.3	18	36.2	26	7	.....	.....	0.78	— 1.05	.....	w.	.....	.....	...	18	6	7	1	.....	...	7	4.24	1886	0.13	1887
Fort Grant	4,860	29.23	30.12	0.44	45.4	+ 1.4	73	54.7	19	36.0	30	6	27.0	54.2	1.58	+ 0.81	4,299	w.	26	e.	8	22	4	5	5	2.8	2.7	13	2.46	1886	0.05	1881
Fort McDowell	.....	.....	.....	.....	48.0	.....	81	62.6	23	33.5	44	12	.....	.....	0.89	— 0.02	.....	sw.	.....	.....	...	16	6	9	5	.....	...	7	3.35	1886	0.00	*
Fort Thomas	2,710	.....	.....	.....	44.2	+ 3.2	74	58.2	19	30.3	43	12	.....	.....	1.92	+ 1.30	.....	nw.	.....	.....	...	13	11	7	5	.....	...	10	2.16	1886	0.03	*
Fort Verde	.....	.....	.....	.....	41.8	+ 0.8	70	53.4	17	30.1	36	12	.....	.....	1.39	+ 0.67	.....	s.	.....	.....	...	15	7	9	9	.....	...	14	2.72	1882	0.00	1885
Whipple Barracks	5,389	24.72	30.14	0.54	32.9	— 1.1	63	44.7	— 3	21.1	40	5	19.8	70.4	2.29	+ 0.97	7,359	sw.	48	s.	18	17	6	8	7	2.5	2.5	15	5.99	1886	T.	1887
San Carlos	.....	.....	.....	.....	42.4	— 6.6	74	55.6	20	29.3	44	12	.....	.....	2.11	+ 1.07	.....	s.	.....	.....	...	18	3	10	6	.....	...	9	2.88	1886	T.	1887
Willcox	.....	.....	.....	.....	43.9	+ 0.9	78	59.4	18	28.4	47	14	.....	.....	1.61	+ 1.31	.....	w.	.....	.....	...	19	7	5	5	.....	...	6	1.61	1890	T.	1887
Yuma	141	29.94	30.09	0.58	51.4	— 2.0	80	63.4	30	39.5	33	10	36.2	60.9	T.	— 0.36	3,953	n.	28	n.	8	24	5	2	0	1.3	2.3	15	1.35	1882	0.00	*
Keeler	3,622	26.31	30.04	0.68	36.0	.....	59	45.2	16	26.8	28	5	19.8	53.4	0.42	.....	5,577	*	40	nw.	10	21	9	1	2	1.6	3.3	5	0.70	1888	T.	1887
Middle Plateau.					29.9	— 5.8									2.29	— 1.23																
Carson City	.....	.....	.....	.....	21.0	.....	50	31.5	—22	10.5	44	9	11.8	70.0	4.97	.....	.....	.....	.....	.....	...	12	6	13	16	4.8	6.2	3	4.97	1890	0.06	1889
Winnemucca	4,340	25.58	30.16	0.84	14.7	.....	48	23.9	—23	5.5	46	4	7.8	72.4	2.96	+ 1.91	8,356	ne.	45	s.	25	13	8	10	13	4.2	5.7	12	3.08	1881	0.21	1878
Fort Du Chesne †	4,900	25.05	30.22	0.90	11.6	.....	40	22.8	—22	0.4	31	8	1.2	76.2	1.02	.....	1,508	s.	30	w.	19	7	15	9	6	6.2	5.5	3	1.02	1890	0.39	1889
Salt Lake City	4,348	25.58	30.13	0.92	24.8	— 3.2	50	32.6	— 2	16.9	25	6	17.1	72.8	3.07	+ 1.60	4,095	se.	32	s.	25	9	10	12	13	4.5	6.0	16	3.07	1890	0.29	1880
Taylor's Ranch	.....	.....	.....	.....	20.2	.....	45	30.7	— 9	9.8	32	8	.....	.....	1.25	.....	.....	*	.....	.....	...	13	8	10	13	.....	...	1	.....	.....	.....	.....
Montrose	5,795	24.24	30.10	0.78	36.6	.....	58	38.1	— 3	15.0	47	9	10.6	55.7	0.80	+ 0.33	3,828	s.	36	ne.	19	15	9	7	8	5.0	4.1	5	0.80	1890	0.16	1887
Northern Plateau.					30.4	— 5.8									2.22	— 0.35																
Boisé City	2,750	27.18	30.13	1.14	22.8	— 5.2	51	32.3	— 9	15.4	28	5	12.6	68.0	1.26	— 1.09	4,131	se.	28	se.	2	2	14	15	11	6.1	7.0	13	3.77	1883	0.44	1889
Baker City	3,526	26.39	30.12	1.02	16.1	.....	45	23.9	—14	8.3	27	8	6.6	71.7	1.55	.....	5,575	se.	30	se.	23	4	9	18	15	7.8	6.7	1	.....	.....	.....	.....
Spokane Falls	1,921	27.94	30.09	1.08	17.9	— 5.1	46	24.2	—23	11.6	27	6	14.8	86.3	3.19	+ 0.34	3,366	sw.	24	sw.	26	1	2	28	26	8.0	9.0	9	4.54	1882	1.79	1884
Walla Walla	1,018	28.94	30.08	1.16	20.6	.....	56	26.8	—10	14.4	32	4	14.7	80.8	2.53	.....	4,907	sw.	40	se.	15	2	9	20	16	7.6	8.1	5	3.45	1886	0.47	1889
N. Pac. Coast Region					33.6	— 5.6									11.02	+ 1.87																
Fort Canby	179	29.65	29.85	1.17	36.0	— 5.0	49	40.0	22	32.0	13	4	33.4	89.2	12.07	+ 3.52	13,471	se.	87	s.	27	5	7	19	25	6.8	7.1	7	12.07	1890	6.33	1886
Neah Bay †	.....	.....	.....	.....	36.4	.....	50	42.2	18	30.5	20	6	.....	.....	16.29	.....	.....	se.	.....	.....	...	5	2	24	22	.....	...	7	22.30	1887	9.33	1889
Olympia	36	29.86	29.90	1.14	32.6	— 5.4	52	37.5	7	27.8	23	4	31.0	91.8	8.36	— 0.60	3,790	s.	24	s.	27	3	7	21	25	7.6	8.4	13	19.69	1880	4.05	1889
Port Angeles †	14	29.84	29.85	1.37	31.4	.....	46	37.3	9	25.5	21	6	28.6	93.7	7.05	.....	2,106	s.	30	ne.	15	2	7	22	20	9.2	7.4	7	8.17	1885	2.96	1889
Tatoosh Island‡	.....	.....	.....	.....	36.7	.....	48	40.4	22	33.0	14	1	.....	.....	13.00	.....	.....	e.	.....	.....	...	10	0	21	22	.....	...	7	16.82	1886	8.49	1889
Astoria	38	.....	.....	.....	35.4	.....	50	39.8	21	30.9	14	5	.....	.....	12.64	+ 0.87	.....	e.	.....	.....	...	6	3	22	24	.....	...	7	18.24	1887	6.75	1884
Portland	80	29.85	29.94	1.05	31.8	— 6.2	55	36.7	12	26.8	19	4	28.0	89.4	11.13	+ 3.69	4,319	s.	36	s.	15	5	2	23	23	8.3	7.2	19	13.71	1883	2.75	1877
Roseburgh †	523	29.44	30.00	0.88	36.3	.....	57	41.4	21	31.2	18	4	31.7	84.0	12.23	.....	2,557	s.	21	se.	15	0	7	24	23	7.8	8.0	13	12.23	1890	2.96	1889
Mid. Pac. Coast Reg.					42.7	— 4.7									7.58	+ 2.80																
Eureka	64	29.97	30.03	0.73	42.2	.....	54	48.0	28	36.3	20	2	37.3	84.5	18.26	.....	5,752	se.	36	nw.	12	3	7	21	25	6.0	7.8	4	18.26	1890	4.25	1889
Red Bluff	342	29.72	30.07	0.73	39.2	— 6.8	54	45.8	22	32.6	23	4	34.6	82.4	6.55	+ 1.65	7,587	se.	48	se.	15	8	7	16	22	5.8	5.9	13	20.71	1878	0.51	1889
Sacramento	64	30.03	30.10	0.71	42.6	— 3.4	58	48.3	29	36.8	20	4	36.4	81.6	6.62	+ 2.64	5,680	se.	42	se.	15	13	7	11	17	5.4	5.2	13	9.26	1878	0.15	1889
San Francisco	60	30.04	30.11	0.69	46.2	— 3.8	59	51.1	36	41.3	16	3	38.6	77.5	9.61	+ 4.68	5,974	se.	30	nw.	13	7	10	14	23	4.5	6.4	19	11.97	1878	1.28	1889
Point Reyes Light	.....	.....	.....	.....	45.5	.....	59	50.2	32	40.8	20	4	.....	.....	8.08	.....	.....	.....	.....	.....	...	10	3	18	17	.....	...	1	.....	.....	.....	.....
S. Pac. Coast Region.					55.0	— 5.0									5.51	+ 2.06																
Fresno	328	29.78	30.14	0.71	42.2	.....	58	50.0	24	34.3	26	5	36.4	81.9	2.12	.....	4,003	e.	23	nw.	13	6	13	12	11	3.6	4.6	3	2.12	1890	0.34	1889
Los Angeles	330	29.77	30.13	0.54	49.1	— 3.9	67	57.7	34	40.5	25	9	37.0	70.5	7.83	+ 5.05	2,947	ne.	17	e.	25	10	13	8	9	4.3	4.3	13	7.83	1890	0.20	1887
San Diego	93	30.03	30.13	0.49	51.0	— 2.0	66	58.4	35	43.6	22	4	41.6	74.8	2.79	+ 0.80	3,698	ne.	28	s.	3	15	11	5	9	3.8	4.2	19	6.95	1886	0.04	1887

NOTE.—The data at stations having no departures are not used in computing the district averages. Letters of the alphabet denote number of days missing from the record. * Two or more directions, dates, or years. † Precipitation measured at the Boston Water Works; takes the place of the measurement at the Signal Office. ‡ Received too late to be considered in departures, etc.

Chart III Precipitation. January, 1890.

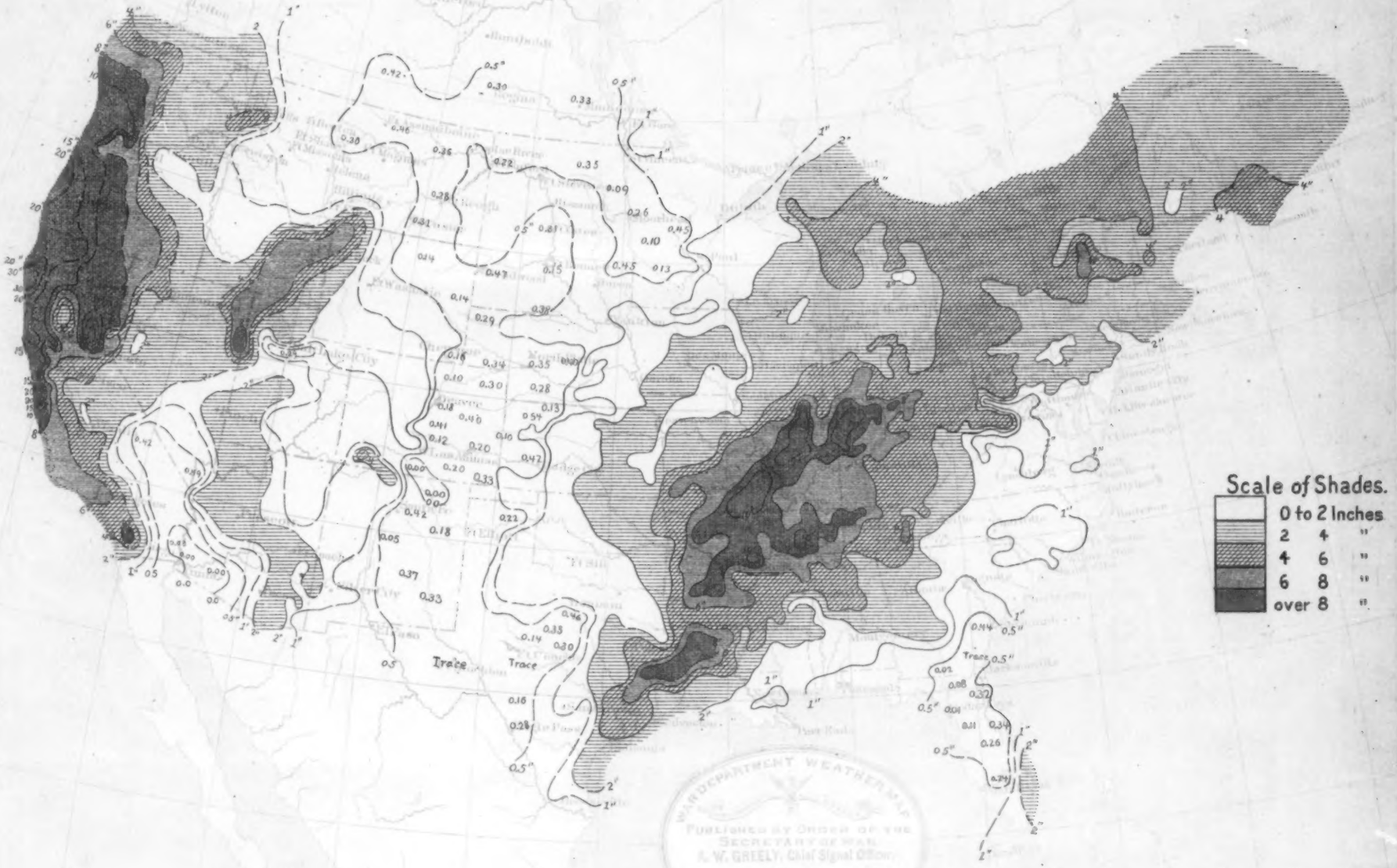
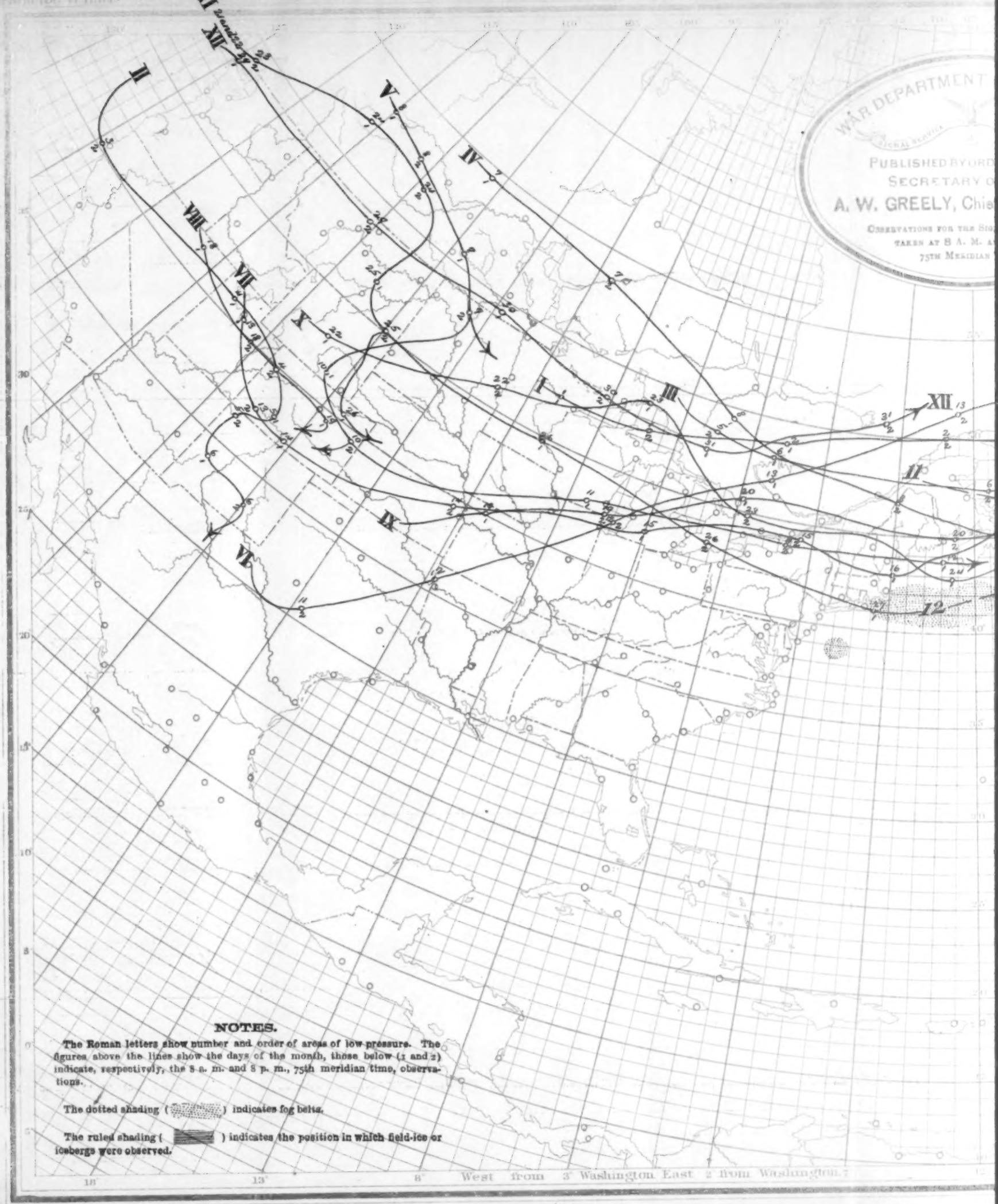


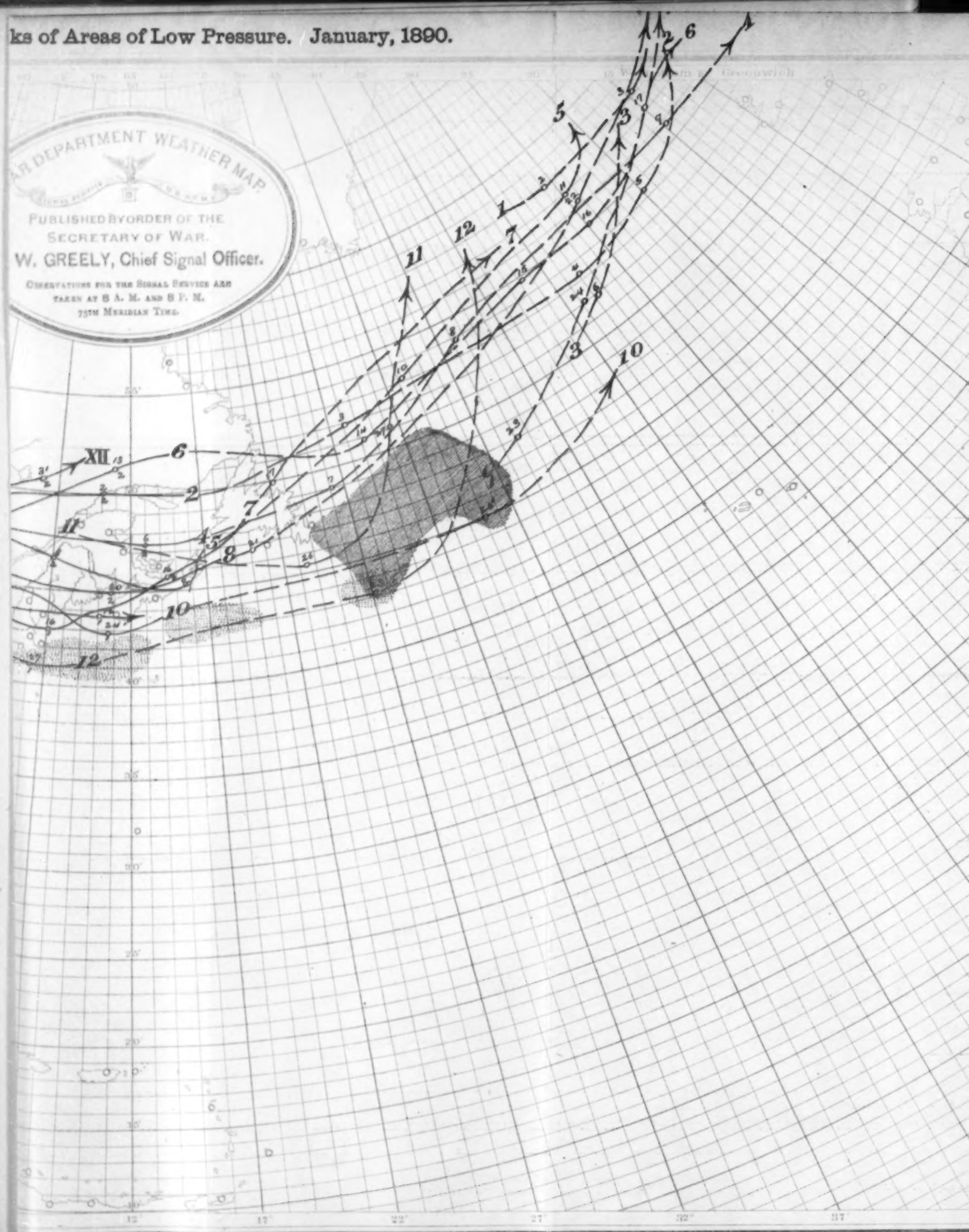
Chart IV. Depth of Snow (inches) reported on ground January 31, 1890, and Limits of Freezing Weather.

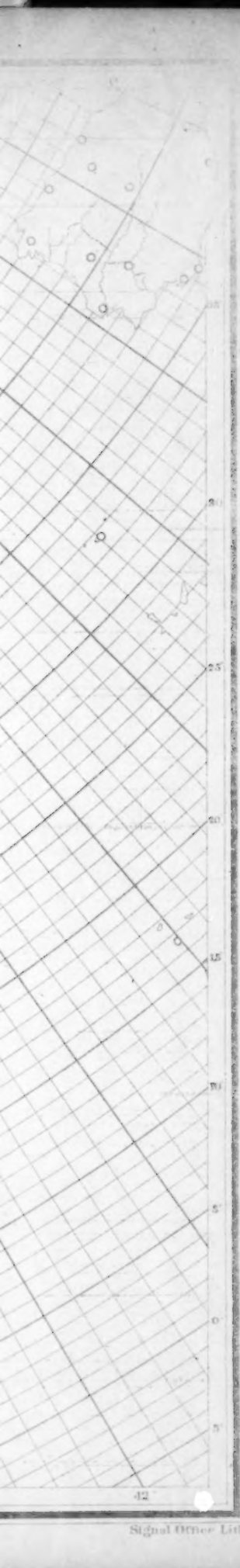
Chart IV. Depth of Snow (inches) reported on ground January 31, 1890, and Limits of Freezing Weather.

Chart I. Tracks of Areas of L



ks of Areas of Low Pressure. January, 1890.





Signal Office Lith

Part II. Isobars, Isotherms, and Winds, January 1890.

Chart II. Isobars, Isotherms, and Winds. January 1890.